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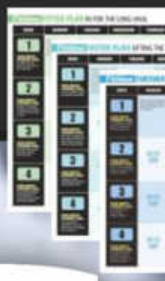

CYCLING Fitness

AERO STRETCHES

GET LOWER GO FASTER

4 Simple steps to better climbing

MAXIMISE YOUR GLUTE POWER!

5 Workout mistakes to avoid

PORTIONS FOR PERFORMANCE

How much should you be eating?

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Editor's letter

It may be approaching the end of summer but that's all the more reason to try and squeeze as much as we can out of the long days and warm weather. By the end of summer most of us are at our fittest so it's a good time to nail that really long ride or have a go at racing for the first time to lay down a marker for next year.

It used to be that cycling had really defined seasons — autumn was for hill-climbs, winter for cyclo-cross, spring and summer for road racing — but those days have long gone. Dry, dusty summer cross is a revelation for anyone who has only raced in the mud. Road racing, especially on closed circuits, takes place all year round and some masochistic fools even enjoy 100-mile sportives in February!

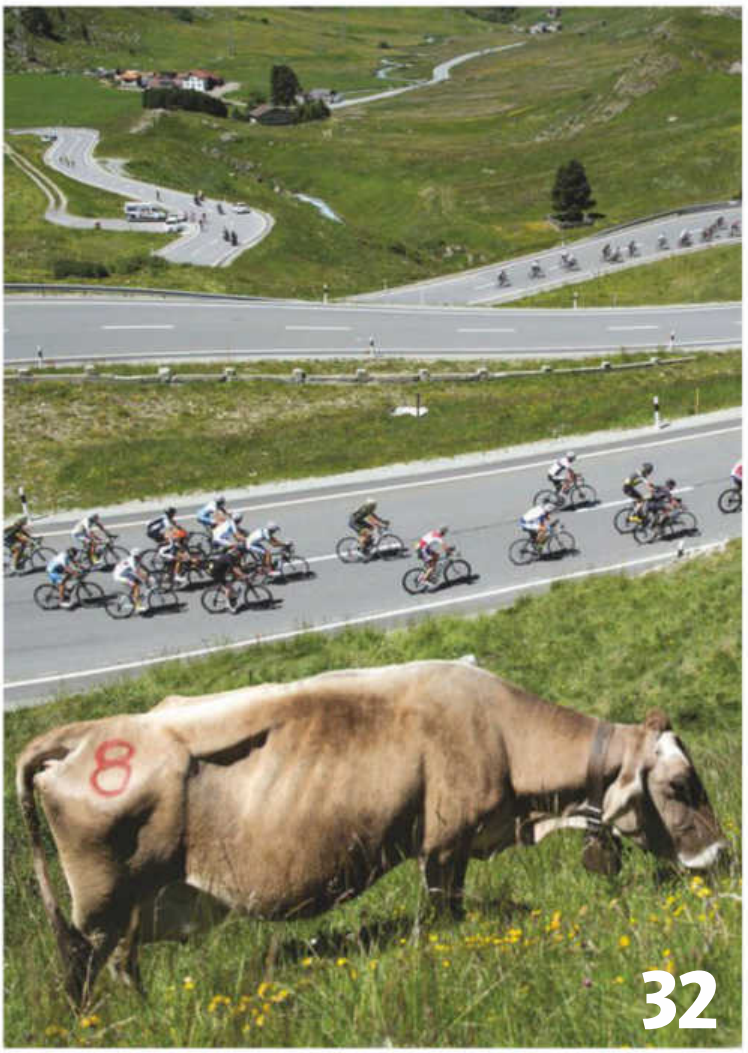
Personally I've always enjoyed the seasonality of cycling as it keeps things fresh and I don't want to do the same thing all year round. No matter what the time of year, there is an event or race to take part in. As September approaches I get a little bit of nervous excitement that cyclo-cross is starting. The smell of autumn, which as a kid signalled 'back to school' time now means it's up into the loft to get the knobbly tyres down.

I am just fickle though, and this is probably one of the (many) reasons I never managed to get that good at any one cycling discipline. A structured, goal-orientated, periodised plan would no doubt have garnered better results but having a go at anything and everything is much more fun!

Hannah

Hannah Reynolds is *Cycling Weekly's* fitness editor. A keen cyclist, Hannah has raced road and mountain bike and has taken part in numerous sportives, including the Etape du Tour and the UCI Golden Bike series. She studied sport science at University College, Chichester, before starting work at *CW*, and continues to keep a hands-on approach to the sport by working as a soigneur and massage therapist in her spare time.

Our knowledge of training techniques, sport science and nutrition is constantly evolving. To stay up to date with all the latest developments that you can apply to your own cycling, check out *Cycling Weekly's* extensive Fitness section in each weekly magazine, or visit our website: www.cyclingweekly.co.uk.



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CYCLING Fitness

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Illustration: Kevin Sharpe

LENGTHEN YOUR WORKOUT WITH BEET JUICE

Want to be able to ride for longer? New research suggests that consuming beetroot juice on a regular basis can increase your endurance performance

Regularly consuming beetroot juice can have positive cardiovascular effects during exercise, which leads to an increase in endurance performance, according to clinical study.

In the study, which was published in the American Journal of Physiology-Regulatory, Integrative and Comparative Physiology, healthy male participants drank beetroot juice for 15 days. At the end of the trial, results showed that participants' blood pressure had lowered and blood vessels had dilated at both rest and during exercise.

The findings suggest, according to the researchers, that beetroot juice can be used as a dietary supplement to enhance oxygen delivery to the muscles and reduce the work the heart does during exercise. "Exercise can be performed at a given workload for a longer period of time before the onset of fatigue," the researchers added.

Beetroot juice's relationship with cycling has been ongoing for many years. A dietary source of the molecule nitrate, it has been shown to dilate blood cells and increase blood flow, which are both important factors for exercise performance.

This is yet another study that highlights the importance of dietary nitrates and why cyclists should start taking this topic seriously. And remember, it's nitrates that have a positive impact on performance, not the food itself. While beet juice is a good source of nitrate, many other foods contain nitrates that will also improve physiological function, such as spinach and cherries.

Can ginger speed up muscle recovery?

Study suggests the potent root may spice up recovery after strength-depleting exercise

Every cyclist knows that sensation when, getting back on the bike after a tough session the previous day, your legs don't have the same punch as usual. The muscles are fatigued and not fully recovered. The solution to faster recovery could be about to change, as research has shown that ginger can speed up the process.

A recent study looked into the effect that ginger, which contains analgesic and certain pharmacological properties found in anti-inflammatory drugs, can have on muscle recuperation.

In the study, 20 participants were asked to ingest four grams of ginger or a placebo over a five-day period, prior to performing high-intensity elbow flexor exercise, which induced muscle damage.

Twenty-four hours after the exercise, both groups had lost significant arm strength, but the two groups differed in how quickly their strength loss improved. The 'ginger' group found that their strength improved 48 hours after exercise, whereas the 'placebo' group didn't see any strength recovery until a further 24 hours later.

These results indicate that ginger was somehow able to speed up the recovery process by a whole day — could this be the start of a ginger nutrition revolution?

Phytother Res. 2015 Jun;29(6):887-93. The Effects of Pre-Exercise Ginger Supplementation on Muscle Damage and Delayed Onset Muscle Soreness. Matsumura MD, Zavorsky GS, Smoliga JM

DRINK TO THIRST

Advice to drink 'ahead of thirst' declared obsolete and dangerous

It's a contentious topic and one in which conventional wisdom has evolved over time. But according to an updated consensus statement on exercise-associated hyponatremia (EAH), the best approach to preventing potentially serious reductions in blood sodium level is to drink when thirsty. These recommendations appear in the June issue of the *Clinical Journal of Sport Medicine*.

Many cyclists are misguided when it comes to hydration. Some don't drink enough, which can lead to dehydration, while others drink too much, risking diluting their sodium levels — which can be life-threateningly dangerous. Symptoms of hyponatremia include headaches, sickness, confusion and dizziness.

"Using the innate thirst mechanism to guide fluid consumption is a strategy that should limit drinking to excess and developing hyponatremia (low blood sodium), while providing sufficient fluid to prevent excessive dehydration," according to recommendations developed at this year's third International Exercise-Associated Hyponatremia Consensus Development Conference.

These recommendations suggest a more balanced approach to hydration. In recent times, cyclists have been advised to drink prior to thirst to avoid irreversible dehydration. This led some riders to become over-cautious or obsessive with regard to drinking fluids, which increased their risk of hyponatremia.

Thankfully the guidelines are now much more straightforward: simply obey your thirst.

FOOD FOR THOUGHT : Pea protein

A new protein substance — made from dried peas — is popping up in recovery drinks and powders. It's a suitable alternative for those who avoid products containing milk, casein or lactose. A 30g serving contains approximately 25g of protein.

Fast food recovery?

Burgers versus recovery shakes

A new study conducted by researchers from the University of Montana has found no significant difference in glycogen recovery between cyclists who ate fast food after a workout and those who ingested traditional sports supplements.

The study, which was published in the *International Journal of Sport Nutrition and Exercise Metabolism,* subjected 11 male cyclists to two experimental trials in randomised order. Each trial included a 90-minute glycogen-depletion ride followed by four hours' recovery. Immediately following each ride and again two hours later, researchers provided participants with either a sports supplement or fast food, e.g. hamburgers, French fries, etc. Following the four-hour recovery period, participants completed a 12.4-mile time trial.

The results showed no difference in blood glucose and insulin responses. Rates of glycogen recovery between the groups were similar too, as were time trial performances.

1lb of muscle, at rest, burns an extra 50kcal per day. So building muscle has metabolic as well as aesthetic perks.

FITNESS FACTS

BECAUSE IT'S WORTH IT!

Pricy products worth every penny

Garmin Vivoactive £199.99

This is an ultra-thin, multi-sport GPS smart-watch. Anything that can be measured can be improved, and if you are goal-orientated and like data, this watch will give you everything you need and more. It's not cycling-specific; instead, it monitors everything from your sleep to the number of steps you take.

You can pair it with all your favourite apps such as Strava and myfitnesspal. The calories expended during your rides and from your steps during the day automatically update your myfitnesspal account, a very handy tool if you are monitoring calorie intake.

The amount of data it produces can lead to stats obsession, but it is a good motivator and helps monitor your whole lifestyle, not just your riding. **www.buy.garmin.com**

Study reveals hole in heart checks

Doubt cast on testing while at rest

In light of recent cardiac fatalities during high-intensity endurance events, the potential importance of heart checks for heartbeat irregularities has been highlighted.

Athletes who take part in endurance exercise such as cycling can develop irregularities in heart rhythm; certain very rare conditions can lead to sudden death. Some athletes choose to undergo heart health screening.

But according to new research, published in the *European Heart Journal*, doctors who try to detect heartbeat irregularities (arrhythmias) by focusing on the left ventricle of the heart, or on the right ventricle while an athlete is resting, may miss important signs of right ventricular dysfunction, which can be fatal.

In this new study, Professor La Gerche found that problems in the way the right ventricle works become apparent only during exercise and cannot be detected while an athlete is at rest.

"You do not test a racing car while it is sitting in the garage," commented La Gerche. "Similarly, you can't assess an athlete's heart [fully] until you assess it under the stress of exercise."

These findings may change the way athletic heart health is monitored. Remember, serious heart defects are very rare. For more information, visit www.c-r-y.org.uk.

Photos: Jessie Wild, Mike Prior

SUGAR AND CARBS 'MORE DETRIMENTAL THAN INACTIVITY'

Editorial in leading journal sounds warning that sugary and carb-laden foods are public health enemy number one and key culprit of the crisis

Many people place the blame for obesity on the doorstep of physical inactivity. But according to experts, the real culprits behind the surge in expanding waistlines are excess sugar and carbohydrates.

"It's time to bust the myth that anyone — and that includes athletes — can outrun a bad diet," said a recent editorial in the *British Journal of Sports Medicine*.

While the authors agree that regular exercise is key to staving off serious disease such as diabetes, heart disease and dementia, they claim that "calorie-laden diets now generate more ill health than physical inactivity, alcohol and smoking combined".

The editorial states: "Evidence now suggests that up to 40 per cent of those within a normal weight (BMI) range will none the less harbour metabolic abnormalities typically associated with obesity. But few people realise this, and many wrongly believe that obesity is entirely due to a lack of exercise."

A large portion of the blame now falls on excessive carbohydrate consumption. The key message from the report is: "Recent research indicates that cutting down on dietary carbohydrate is the single most effective approach for reducing all of the features of the metabolic syndrome, and should be the primary strategy for treating diabetes, with benefits occurring even in the absence of weight loss."

The authors are keen to impress on people that they should not become obsessed with calorie counting but should rather focus on the source of the calories.

"Sugar calories promote fat storage and hunger. Fat calories induce fullness or satiation," states the article. "The prevalence of diabetes increases 11-fold for every 150 additional sugar calories consumed daily, compared with the equivalent amount of calories consumed as fat."

It also states that public health messaging is unhelpful and misleading, with an urgent need to steer people away from unhealthy carbs. "Celebrity endorsements of sugary drinks and the association of junk food and sport must end," the experts declare. "Health clubs and gyms need to set an example by removing the sale of these products from their premises. The health halo legitimisation of nutritionally deficient products is misleading and unscientific."

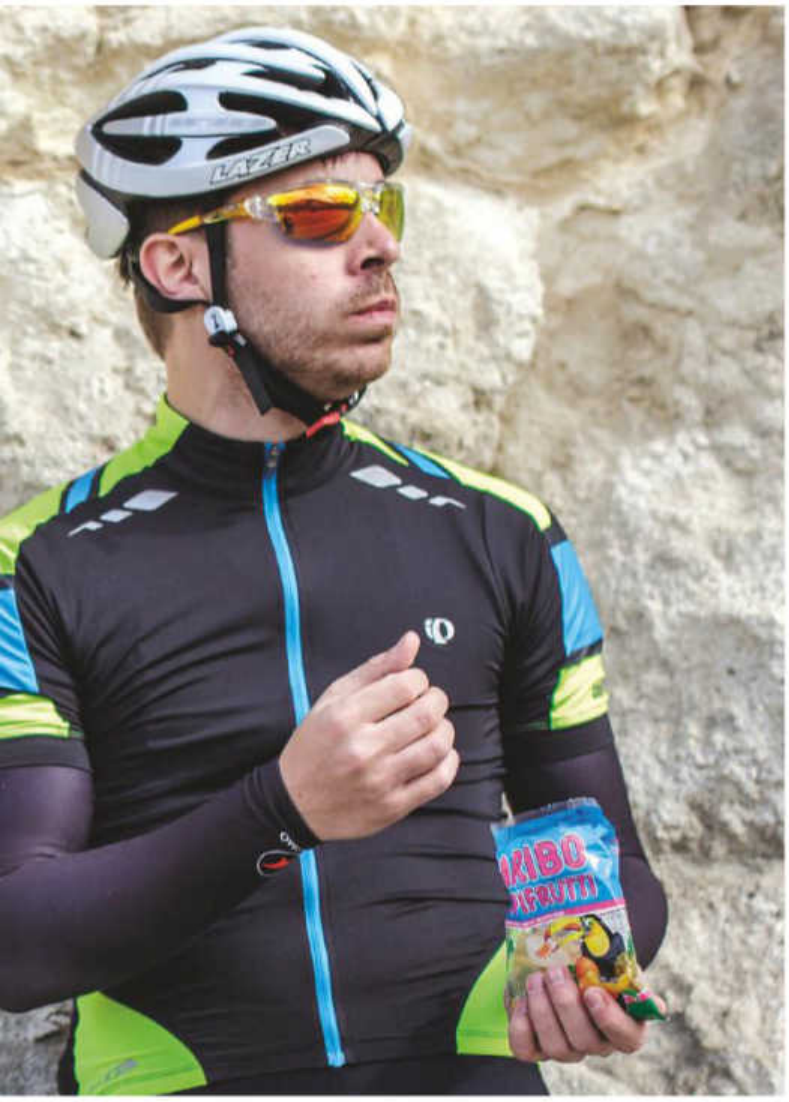
The editorial concludes, "The food environment needs to be changed so that people automatically make healthy choices. This will have far greater impact on population health than counselling or education. Healthy choice must become the easy choice."

For every gram of glycogen you store, you also store three grams of water. If you are carb-loading before an event, this may equate to weight gain of up to:

2KG

Exercise more, live longer

Daily exercise slashes risk of early death, survey indicates



New research suggests that 30 minutes of physical activity six days a week, irrespective of its intensity, is linked to a whopping 40 per cent lower risk of death from any cause among elderly men. The study, which was published in the *British Journal of Sports Medicine*, stated that boosting physical activity in this age group is as good for health as giving up smoking.

These findings were based on observations of over 26,000 men born between 1923 and 1932 who had their health checked in 1972 and again in 2000. Subjects' personal details were recorded and they were also asked to respond to a validated survey on their weekly leisure time and physical activity levels.

The analysis of the results indicated that less than an hour a week of light physical activity was not associated with any meaningful reduction in risk of death from any cause. But more than an hour was linked to a 32-56 per cent lower risk. The more time spent doing vigorous exercise, the lower the risk seemed to be. Men who regularly engaged in moderate to vigorous physical activity during their leisure time lived five years longer, on average, than those who were sedentary.

Overall, the results showed that 30 minutes of physical activity — of light or vigorous intensity — six days a week was associated with, on average, a 40 per cent lower risk of death from any cause.

Though this is an observational study, from which no firm conclusions about cause and effect can be drawn, it does make interesting reading and should encourage older people to either start exercising more or maintain their current regime.

Aerodynamic drag is the main thing slowing you down once you exceed 15mph. At 20mph you are displacing 1,000lb of air per minute.

FITNESS FACTS

Fitness foods warning: do not contain fitness

Snacks branded 'fit' may be misleading

Sports nutrition products with packaging that makes claims of fitness benefits may encourage consumers to eat more and exercise less, undermining efforts to lose or control weight, a study has claimed.

Many sports nutrition companies produce so-called 'health snacks' — a seemingly healthier option than a traditional confectionery snack bar such as a Snickers or Mars.

But researchers believe these 'healthy' bars are in fact damaging health.

"Unless a food was forbidden by their diet, branding the produce as 'fit' increased consumption for those trying to watch their weight," state the authors. "And to make matters worse, these eaters also reduced their physical activity, apparently seeing the 'fit' food as a substitute for exercise."

The authors investigated the effects of fitness-branded food on consumption and physical activity in 'restrained' eaters, who are chronically concerned about their weight.

Participants in the study were given the choice of certain foods and snacks marked either 'fitness' or 'trail mix'. Another part of the study gave them the option to exercise as vigorously as they liked on a stationary bicycle after eating the snack.

The results showed that those who were specifically trying to watch their weight ate far more of the snack marked 'fitness'. Those eating the 'fitness' brand also chose to expend less energy during the exercise phase.

Looking for shortcuts to fitness is understandable, and there may be an unconscious belief that simply eating a 'fitness' food will result in being fitter and negate the need for exercise. If only it were so simple.

The authors concluded: "It is important that more emphasis be placed on monitoring fitness cues in marketing. For example, a brand could offer gym vouchers or exercise tips instead of just implying fitness via a label or image.

"Reminding the consumer that exercise is still necessary may help counteract the negative effect of these fitness-branded foods."

Photos: Jesse Wild

DO YOU REMEMBER YOUR FIRST TIME?

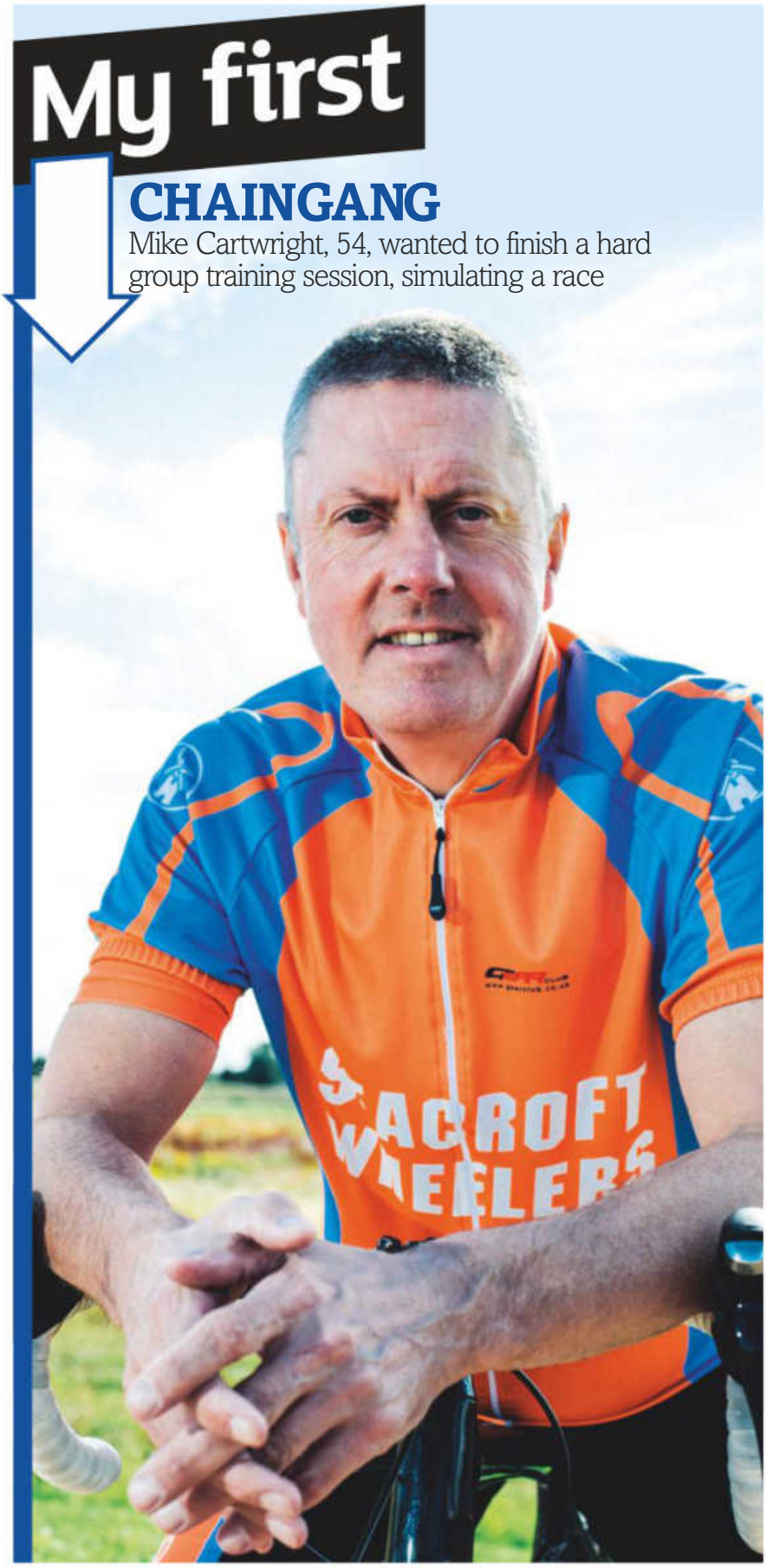
One of the best ways to get fitter and faster on the bike is to set a target, and one of the best things about cycling is that there are so many targets to choose from, based on either distance, speed, technique or competition.

Simon Schofield talked to a number of cyclists who had set a target this season, and nailed it. As we take stock of the 2015 season so far, it's a good time to consider what your target for next season might be

My first

CHAINGANG

Mike Cartwright, 54, wanted to finish a hard group training session, simulating a race



Mike Cartwright had been cycling for three years with a small group of mates when, for various reasons, they all stopped going out on the bike. He missed the company but felt very nervous about joining a club to find others to ride with.

"At 52, I thought I was too old for a club. I thought it would be full of younger, fitter riders and would be all about racing."

But his local club, Seacroft Wheelers, confounded those expectations and he joined. He got fitter, made new friends and once he'd developed confidence on social rides he started to think about the harder, faster group training rides of chaingangs.

Many clubs run chaingangs, usually 20-30 miles long, often over flat or gently rolling terrain on a midweek evening and feature two lines of cyclists. The left line moves 1-2mph slower than the right line. Riders join the right line at the back, progress up it as the leading rider moves to the left, and eventually gets to the front where they face a short period in the wind, before moving to the left. The whole group rolls continuously and weaker riders get dropped off the back. It is usually a fast, hard training ride at an average speed of over 20mph for an hour or more, and the serious effort brings huge training benefits.

"At that time my club didn't have a chaingang, so I went to one run by another local club. I got about a mile and got dropped off the back. I didn't enjoy it — in fact, I'd say I hated it! There were lots of people there I hadn't ridden with before and I didn't like getting dropped one little bit," says Cartwright. "I just thought it's not for me — I'll stick to social riding."

Cartwright's experience is not uncommon. The first time out on a new chaingang tests most riders as they get used to the pace and style of the ride. It needs a high level of concentration and understandably there are nerves about being in a competitive environment.

A year after his first chaingang, Cartwright was on a ride with a group of similar ability, and it turned into an impromptu chaingang. "The senior riders shepherded us but we did the two lines. I was nervous and it was intense but then I started enjoying it. It was very rewarding."

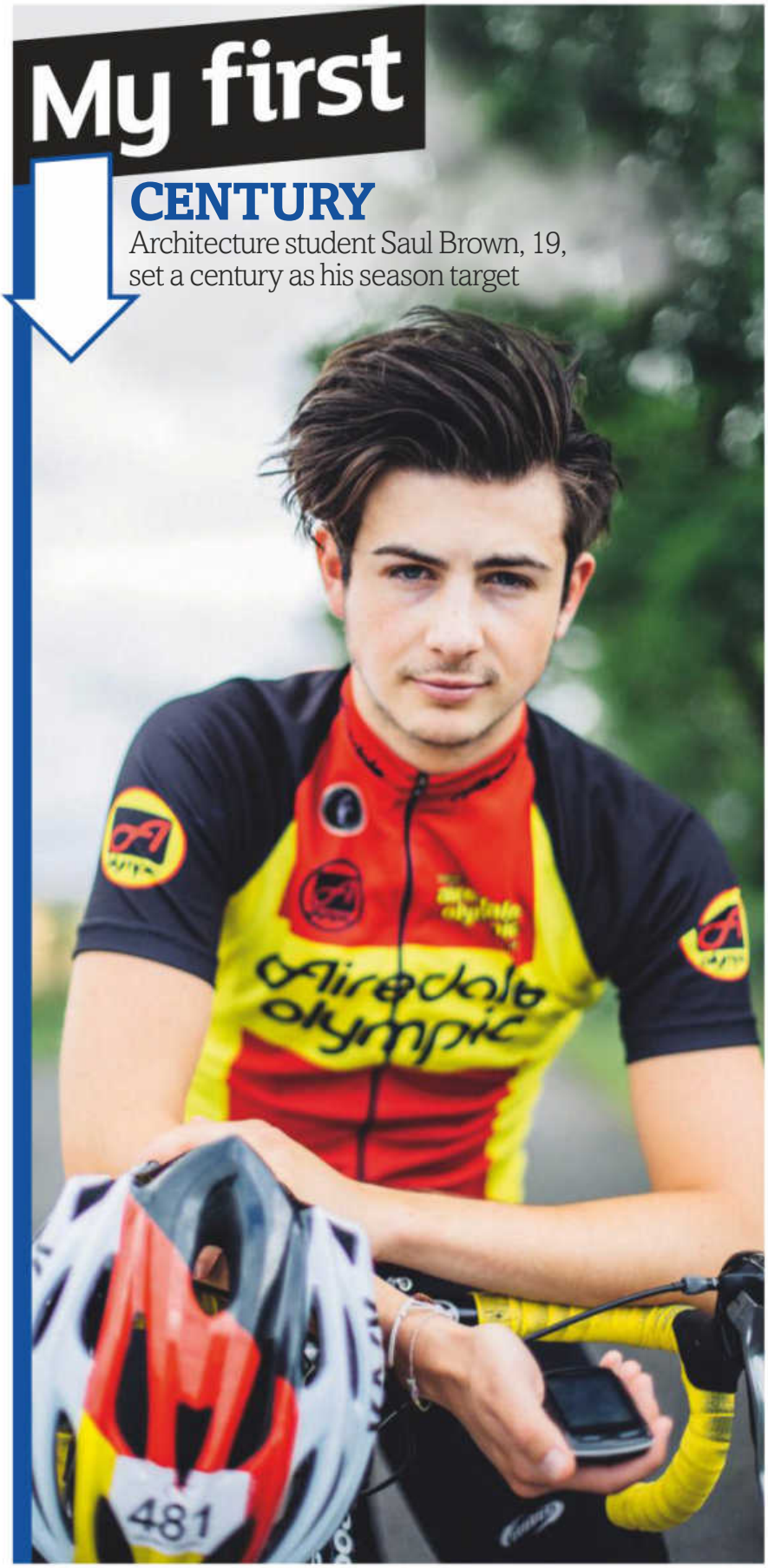
His confidence restored, Cartwright decided to have another go at the other club's regular Tuesday night chaingang. This time, he hung on. And he went back the next week, and the one after. Now he's a regular. "If somebody had said to me that I'd be doing 30 miles at well over 19mph in a big group of 20 riders on a regular basis, I'd have said, 'Don't be daft,' but I am and I love it. It's so exhilarating and it's done wonders for my fitness."

Cartwright is now so converted to the chaingang cause that he is a leading light in his club's brand new chaingang, which he and another member have just established. "You have to persist and keep trying," says Cartwright of his own experience. "It's great, you get a real buzz from it."

Photos: Daniel Gould

My first CENTURY

Architecture student Saul Brown, 19, set a century as his season target



New cyclist Saul Brown soon cottoned on to the motivational benefits of target-setting. "I wanted to challenge myself and get a century under my belt," he says. His first move was to join a club. "I felt a bit vulnerable cycling on my own. I wanted to meet cyclists, ride with them, learn from them, and find new routes.

"I joined Airedale Olympic CC and I loved it immediately. Everyone's been really friendly and welcoming. I've made new friends and seeing some of the guys in the club who are lifelong cyclists has been really inspirational."

Brown went out on the Sunday club runs, clocking up 60 and 70-mile rides, and tried to fit in a midweek ride too. He also nipped out for shorter rides whenever possible. Before long, his weekly mileage was up to a minimum of 100 and, on good weeks, 150. For a rider training for a century, this is a good weekly target, and if it's achieved consistently will greatly increase the chances of getting that 100 miles done at the first attempt.

By spring, Brown felt good enough to ride the Tour de Yorkshire sportive. At 92 miles, it was short of his ultimate target, but it was another sensible decision. Riding a "rehearsal" of your target ride is a good move. It doesn't need to be as close to 100 as was Brown's — anything up to 80 miles is considered close enough. This ride also used similar terrain to Brown's target ride, the Etape de Yorkshire, a very big challenge at 126 miles long.

"The weather was extremely challenging. It was absolutely bucketing it down at the start, but it did clear up later. The distance was tough and there was climb after climb after climb, but I made it," says Brown. He rode the event in the company of clubmates, another excellent decision. The mutual support — especially when the weather throws in a curveball — is very valuable.

Brown continued to train well, building up to a maximum of 200 miles per week. He then took a full week's rest before his big season challenge in July. He'd obviously listened to some wise words from within his club because a taper like this is the perfect preparation for a big ride.

The day dawned, and alongside seven clubmates, Brown set off on the hilly route. He paced himself carefully, especially on the hills, and by early afternoon he had the satisfaction of seeing the magic 100 tick up on his computer.

But a few miles later, drama. "I had a tiny lapse of concentration and clipped the back wheel of another rider. I came off. It wasn't too bad, I wasn't hurt but I bent my rear mech." Brown had to complete the last 20 or so miles without his two lowest gears, which made the last few hills especially challenging. But he gritted his teeth and crossed the line in about 8.25 hours. "I was really happy to finish. I was really proud of myself — none of my friends have done anything like this."

My first SPORTIVE

Louise Johnstone, 45, "a complete novice", decided to ride her first hilly sportive

It all started on New Year's Eve. "We were a bit tipsy and decided to sign up for a sporting challenge. We did it, there and then, and entered a triathlon as a team of three. We drew lots, and I got the bike leg," says Louise Johnstone.

"I couldn't even ride a road bike without someone holding me up — I was that much of a novice."

But Johnstone's cycling journey had begun. She borrowed her daughter's road bike and endured the "falling-off-the-first-time-out-on-clipless-pedals" routine but persevered. Johnstone is lucky enough to live in York, where there's a superb closed circuit track facility, which she used for practice and to gain confidence.

Then she heard about a women's day at the track. "That was the massive turning point for me. There were women coaches, it was all women riders and we learned skills in the morning and had races in the afternoon. It was brilliant."

Johnstone completed the 20km ride in the triathlon. "I was hoping for an hour — and I smashed it in 41 minutes!" — and continued the women-only coaching sessions, working up to 40-mile rides out on the road. She'd been riding a road bike just four months when she decided to enter a sportive, the Pock Pedal, set in the beautiful but challenging terrain of the Yorkshire Wolds. She recced a few of the hills and set out on the day in the company of one of the coaches from her sessions.

"I decided I needed some practice on hills. My goal the first time I did a long hill was to get all the way up without stopping. Then I started timing myself on Strava. I was fairly pleased when I got up it in eight and a half minutes. Then I did it a few weeks later and got a QOM!"

"There were 400 riders and it was a really good atmosphere — everyone was there for the same reason. I finished the 60 miles in four and a half hours, just outside the gold time. It was fantastic.

"It did show me that I still lacked a bit of expertise in some areas, like climbing out of the saddle, descending faster and accelerating out of corners, so I am continuing the coaching."

But with the sportive under her belt, her confidence rising and, having lost 2.5st in under six months, Johnstone isn't stopping. "As my fitness improves, I'm trying new things. I went out on a club chaingang the other week. It was brutal and I got spat out of the back, but it was great," she says. "I've joined a club, Clifton CC, and I'm doing regular club rides. Last week, I did my first 100 miles.

The transformation for Louise has been radical. It has been achieved with her own determination alongside support from the coaches at the track sessions and club riders. "If I can do it, an overweight, middle-aged couch potato, then anybody can. It doesn't matter what age or shape you are. I'd recommend it to anyone — especially middle-aged women."

My first

FOREIGN SPORTIVE

Hannah Mathers, 31, picked a notoriously tough ride, La Marmotte, to test herself

Hannah Mathers is a helicopter pilot in the army. "I've done some very challenging things, both mentally and physically, in my time in the army. I think the Marmotte was harder than any of them," she says.

Mathers is relatively new to cycling — she took it up a couple of years ago when "my husband dragged me into triathlons". She quickly realised the bike leg was the best part of tri and decided to concentrate on cycling. "I've got to have a decent level of fitness as part of my job and with all the tri training I was in reasonable shape, so last year we did a cycling holiday in the Alps. I wasn't racing up the hills but I got to the top and the whole experience was a real eye-opener. I loved it," she says.

Mathers set her sights on a foreign sportive, and after considering several, she and a group of work colleagues settled on the Marmotte. This one-day event is among the toughest of Alpine challenge rides, as 7,500 riders cover around 5,000m of climbing over famous cols, ending on the legendary Alpe d'Huez climb.

Mathers trained during winter on the turbo and WattBike. "I struggle with focus on static bikes but I stuck with it," she says. As the weather improved, she combined long weekend rides with a weekly crit race and club chaingangs. "You can always do more, but when we got to France I felt happy with my fitness."

What she wasn't prepared for was the heat. This summer has seen the Alps bake, and the day of the Marmotte was one of the hottest. Despite that, the atmosphere in the pens at the start was electrifying. "I'd never seen anything like it. Thousands of riders, music blaring out, noisy, busy — I felt like I was at the beginning of a Tour de France stage," she says.

"The first bit was basically a chaingang up the valley. It was brilliant and I felt really strong." Hannah conquered the first couple of climbs fairly easily but there were already signs of what was to come. "It was so hot. Somebody said it peaked at 45°C. People were almost fighting for water at the feed stops and I saw some riders lying fully clothed submerged in mountain streams just to cool down."

Mathers encountered a "real low spot — I felt spent" in the middle but she rallied and eventually found herself at the bottom of Alpe d'Huez. "It was carnage. There were more people sitting at the side of the road than riding up. With 10k to go, I actually almost gave up. I had a proper wobble and I had to have a word with myself."

She pushed on and crossed the line, surrounded by cheering crowds. It had taken her just over 11.5 hours. "You're cycling through a wall of sound. It was amazing. I got a bit teary at the end but even though it was hard I feel overwhelmingly positive about the event. It was fantastic."

Mathers is now hooked and is already researching her next big foreign sportive.

What is the ULTIMATE CYCLING TEST?

Cycling is a sport known for the suffering it inflicts on participants, but is there a particular event that's harder than all the rest? *Dan Henchy* compares five types of bike race in an attempt to settle the matter

The Tour de France is often feted as the toughest endurance event in the world. At a more 'normal' level, every cyclist has an appreciation of the effort required to ride a bike.

Novice cyclists strain at every pedal rev and long for the day when they can ride with effortless grace like the pros, only to be told, "it doesn't get easier, you just ride faster".

There's no doubt that cycle sport and hardship go hand in hand, whether you're new to the game or a wizened old racer. What we need is some objectivity, some comparison to get a firmer grasp on how this hardship is defined. If cycling is a sport steeped in suffering, the question is posed: which discipline within cycling offers the hardest challenge?

No doubt you have your own opinion on which is the toughest, probably coloured by the experience of your most challenging days out on the bike. However, to bring some rigour to the arguments, we need a set of criteria against which to judge our events. Here are five different aspects that make cycling so testing:

PAIN The agony that every cyclist knows: your legs are screaming, lungs are burning and your face contorted as you try to squeeze out every last drop of power.

SUFFERING Slightly different to pain, this is the gradual grind as you try to keep a gear turning at a beyond-comfortable pace. It can continue for minutes, or hours. A moment of suffering isn't a problem (unlike pain), but the accumulation of time at an this awful level can be just as tough.

ENERGY EXPENDITURE Some events can be completed simply with the fuel in your legs; others will leave you raiding the fridge for hours after the event; and some will require significant effort during the event to top up your energy levels.

DANGER Hurtling along with little more than an inch of rubber holding you to the road and nothing but Lycra to protect you in the event of a mishap, there's little doubt that cycling poses a risk. Our fourth factor refers to the specific dangers of the event.

MENTAL TOUGHNESS Linked to all of the above, the psychological impact of cycling had to be included in our criteria. This can be the challenge of psyching-up for a race, coping with the physical challenge during the event or the mental strength needed to outlast or outwit rivals.

Without further ado, let's look at five of the more popular cycling disciplines — hill-climbs, cyclo-cross, time trials, road racing and ultra events — and score them out of 20 for each of the above criteria.

HILL-CLIMB

What is the ULTIMATE CYCLING TEST?

Pain	20
Suffering	10
Energy expenditure	3
Danger	1
Mentality	5
TOTAL	39/100

HILL-CLIMB

If cycling and suffering are so intimately linked, it seems natural that climbing should feature in our list of toughest tests. Octave Lapize famously exclaimed, "*Vous êtes des assassins*!" at officials after the first inclusion of the Col du Tourmalet in the Tour de France, but you don't have to look to the mountains of Continental Europe for your fix.

The Catford CC Hill-Climb (run every year in October in the UK) is billed as the oldest continuously running cycle race, with riders competing to summit the infamous Yorks Hill in the shortest time possible. If organised competition is not your cup of tea, Strava offers a similar opportunity to measure your best effort on a local climb.

Our first candidate for the toughest cycling event is the hill-climb — an event that requires you to cycle from the bottom to the top of a hill in the fastest time possible. We'll restrict this to UK climbs, which typically take two to 10 minutes to summit.

The effort required to succeed in a hill-climb is significant. Any event where the organiser feels obliged to provide helpers to 'catch' the racers as they cross the finish line is clearly designed to cause maximum pain! If you've ever gone flat-out for a Strava KOM and got to the stage where you get tunnel vision and a metallic taste in the back of your throat, you'll understand the sensation. Longer climbs might involve a modicum of suffering as you hang on to the effort to the summit, but the hellishness involved is at least relatively short-lived.

There's little danger involved (but get a check-up from the doctor before you commit to a programme of brutal maximum efforts). The mental toughness comes in the hours and minutes leading up to the event as you prepare to lock yourself in the hurtbox. Our first event scores as follows:

Photos: Andy Jones

CYCLO-CROSS

What is the ULTIMATE CYCLING TEST?

Pain	15
Suffering	15
Energy expenditure	10
Danger	12
Mentality	8
TOTAL	60/100

CYCLO-CROSS

Cyclo-cross is a discipline witnessing a resurgence in recent times. The top professional riders such as Marianne Vos and Zdenek Stybar have combined success on the road with World Championship jerseys in cross, while an increasing number of young riders are getting their first introduction to the sport in cyclo-cross races.

Cross races begin with a flat-out sprint for the first corner, narrow twisting circuits make overtakes difficult and often if you're not among the top five into the first corner, you can forget hopes of overall glory. This initial effort puts you straight into the red, and you can expect to stay there for most of the next hour. The exact nature of the effort depends on the course design, but you can expect a continued sequence of hard efforts with incomplete recovery.

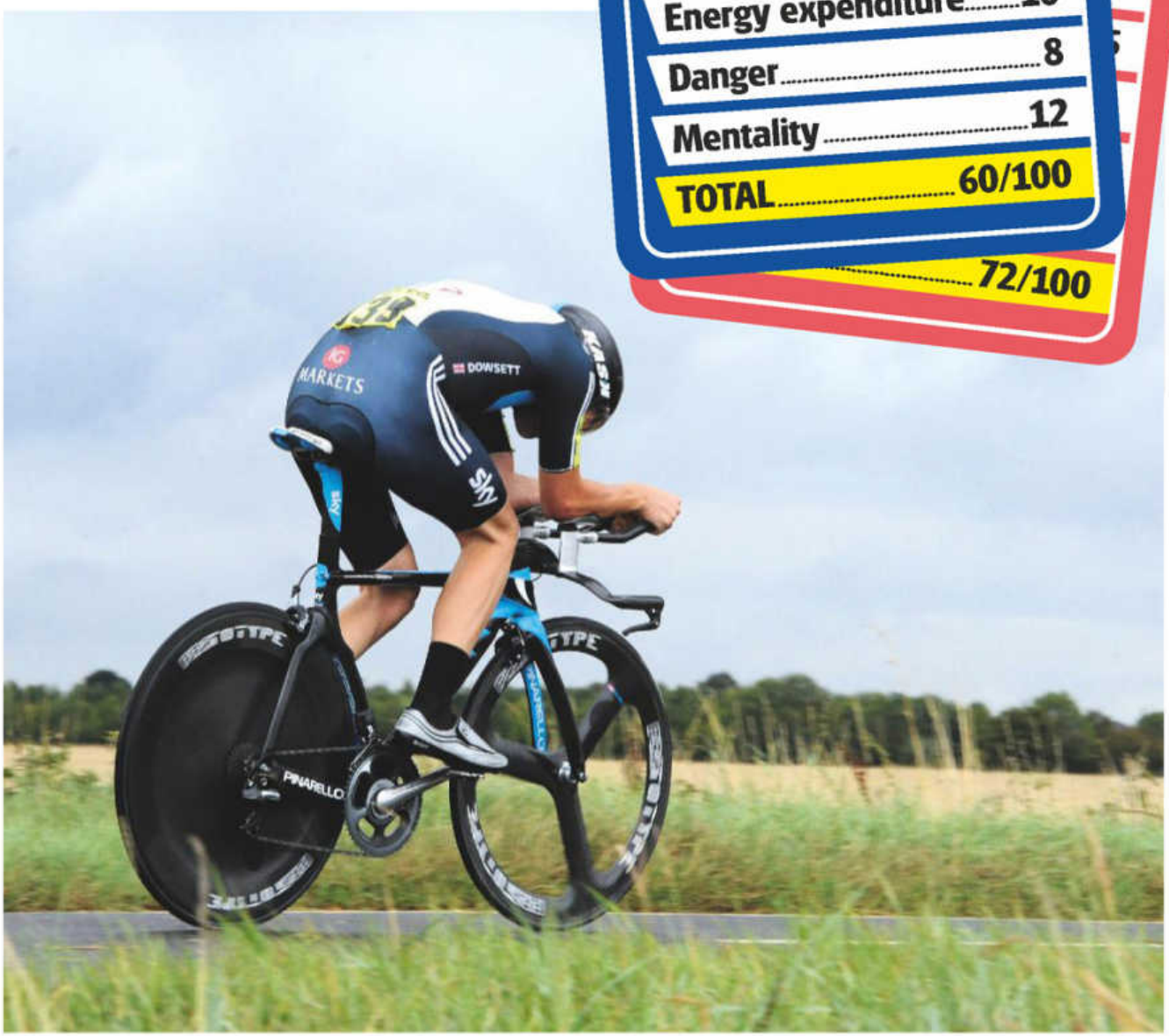
An hour's race isn't overly demanding in terms of total energy requirement, and although the technical courses and varied riding surfaces often lead to crashes, most are at slow speeds with a relatively soft landing. Mentally, the challenge comes from keeping concentration as the physical fatigue sets in. Handling mistakes become more likely towards the end of the race, and it takes a mentally strong rider to be at the best in the latter stages.

TIME TRIAL

The time trial is seen by many as the fairest test of cycling prowess and has adopted the moniker 'the race of truth' for that very reason. Pick a course and ride it as fast as possible, and the rider with the fastest time is declared the winner. The Hour record is a slight variation on the theme. After successfully breaking the Hour record in 1972, Eddy Merckx claimed that the effort had knocked several years off his cycling career and maybe a similar amount of time off his life expectancy.

The effort involved in a time trial is a measured one, though. The top riders know that it is a fine balance between riding hard enough to empty the tank by the finish line, but not so hard that you risk blowing up before the end. As such, the early stages of a well-ridden time trial should feel relatively controlled before a gradual rise in effort level. At the halfway point, you doubt that you can sustain the effort, with increasing desperation for the arrival of the finish line from that point on. While the effort in the early stages may be easier than in a cross race, the second half of a time trial can and should be among the most miserable experiences you can have on a bike — such is the intensity and desperation.

Solo riding means that the danger is minimised, but stiff carbon frames and wheels are very unforgiving if you make a handling error. Given the temptation to push the limits in the corners to shave off a few seconds, and the risk of a painful mishap is always there.



Photos: Andy Jones

ROAD RACE

From the Tour de France stage to a local fourth-cat circuit race, road racing draws in cyclists of all ages and all standards. For those who commit to life in the peloton, it can become an all-consuming love affair with the bike and competing with those around you. Writer Tim Krabbe described the devotion of some riders best with his infamous line: "Non-racers: the emptiness of those lives shocks me."

The beauty of the flowing peloton and the vibrant colours of the group that we see on TV belie the brutal reality of road racing. There are moments within any race when maximum efforts must be made in order to stay with the race or make a bid for glory. This could be equal in effort to that of the hill-climb. Equally, a maximum effort in the sprint in a last-ditch lunge for the line involves lung-busting intensity and huge crash risk. Road racing can score pretty highly on our pain scale!

What's more, road racing is different to time trialling in that the effort level is dictated for long periods by other riders. Anyone who's followed a stronger rider for a significant time will know the effort required to hold a wheel that seems to be for ever inching away from you. The propensity for suffering is thus very high in road racing. Add in the fact that many races involve long days in the saddle, and the energy expenditure can be vast.

Forcing a peloton of up to 200 competitive, motivated and freakishly fast riders on to one narrow stretch of road is on the face of it quite ridiculous, and it's no wonder that any road racer with any time in the sport has more than their fair share of 'get downs' and that crashes are frequent. The danger is ever-present and only adds to the toughness.

Throw all of this into the mix and the mental energy required to compete is massive. The event is long but the crucial split or winning move can come at any time. You're focused on trying not to bring down those around you and expected to read the race and be in the right position at the right time, all the while riding close to your physical limit. Even the thought of it is tiring.

So road racing scores highly on all of our five categories, although it doesn't quite get maximum scores in certain categories where only the specialist disciplines score higher.

ULTRA-ENDURANCE EVENTS

If the hill-climb represents one of the shortest events in which a cyclist can compete, we also have to consider those events at the other end of the spectrum. Ultra-endurance events are those that can be expected to take 12 hours or more — two of the most famous example are Land's End to John o' Groats (LEJOG) or the infamous Race Across America (RAAM).

The length of such a challenge dictates that you will never feel the need to exert yourself to the extent that the effort is painful. You might suffer cramp, though, and contact points can become sore.

Where the ultra-endurance events really take their toll is on energy levels and mental toughness. Calorie consumption becomes a full-time job on rides like this, and you can expect to consume upwards of 5,000kcal a day and still run a deficit.

Mental toil is endless as you cycle through ups and downs with nothing but your thoughts for company. And there is a modicum of danger involved when such extended periods of riding are involved, while night riding and reduced concentration from fatigue pose their own risks.

ULTRA-ENDURANCE EVENTS

What is the ULTIMATE CYCLING TEST?

Pain	8
Suffering	15
Energy expenditure	20
Danger	10
Mentality	20
TOTAL	73/100

CONCLUSION

So which do you think is the hardest event you've ever done? The above list is by no means exhaustive (pun intended) — off-road specialists or trackies will no doubt baulk at the omission of their events from the list. OK, our scoring system isn't necessarily perfect or unbiased. While the road race scores highest as the toughest event, many a race has been won by a wily old sprinter who's barely turned a pedal until the final last-ditch dive for the line. Perhaps the toughest event shouldn't be one that can be won without being the strongest rider. The solution is simple… try them all and make up your own mind as to which one is the toughest!

Photos: Andy Jones, Hot chillee


BOX HILL
ORIGINAL
SPORTIVE
SPORTIVE SERIES
Cycling WEEKLY
SUNDAY OCTOBER 11
FRIENDS LIFE, DORKING, SURREY
Surrey's finest climbs
FULL ROUTE DETAILS & SIGN UP AT
BOOKMYRIDE.CO.UK
PowerBar
cycleplan
SHIMANO

NEW RULES OF TRAINING

Fitness techniques and practices have changed so much, *Hannah Reynolds* thinks it's time to give the training rulebook a refresh

OLD RULE Long, steady rides are the foundation of your fitness

Training used to be about spending as many hours on your bike as possible. Occasionally referred to as LSD — long steady distance — riders felt under pressure to pile up the hours every week. It was all about getting the miles in. But who has time for that? If we are lucky we can carve out a set number of hours a week to ride, and seldom have the chance to up our mileage.

Thankfully, research is showing that we can get the same, or even greater benefit, in less time by doing very short, but very hard sessions. Research has shown that a 20-minute high-intensity interval session results in multiple benefits to your training. Work carried out at the National Institute of Fitness and Sports in Kagoshima, Japan, concluded that this form of training can increase anaerobic capacity (i.e. when you're exercising upwards of 90 per cent of your maximum heart rate) by as much as 28 per cent, while 'moderate intensity' training had little effect.

As well as saving you time, a set of intervals at near-maximal effort (20/40s, for example, where you go flat-out for 20 seconds, then recover for 40 seconds) can also hike up your VO2 max, which means your body can utilise more oxygen. This will also increase your post-exercise calorie burn, as your metabolic rate will remain elevated for some time.

NEW RULE Short, hard intervals offer big improvements

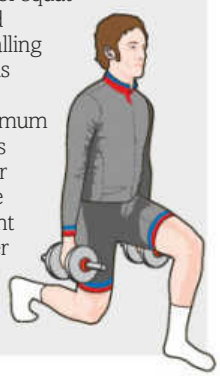
Photos: Chris Auld

OLD RULE Ride your bike, ride your bike

NEW RULE **Cross training and core work are key**

It used to be said that the best training was just to ride your bike. While specificity is one of the key principles of training, just riding your bike isn't enough. The natural imbalance on your musculoskeletal system inflicted by doing no form of sport other than cycling can leave you susceptible to injury, or put you at a performance disadvantage. Simple weight (or bodyweight) training techniques, such as squats and lunges, can significantly improve your leg strength, too.

A study undertaken at Telemark University College, Norway, found that a programme of squat exercises improved efficiency and pedalling economy, as well as extending time to exhaustion at maximum aerobic power in its subjects by 17.2 per cent. Also, for bone health it is important to do exercise other than cycling, as explained on page 46.



OLD RULE Never stand when you can sit, never sit when you can lie down

NEW RULE **Move!**

Cyclists love this rule, as it's a great excuse to be lazy! After a training session or ride there is nothing better than a little sleep on the sofa, especially as you can justify it as recovery. Few of us are training hard enough or often enough to need to adhere to a rule of doing absolutely nothing when not riding, especially if you are trying to lose weight.

Regularly moving helps keep your metabolic rate high and burns more calories throughout the day. Moving frequently, such as taking the stairs instead of sitting immobile at your desk, is good for increasing calorie burn. It's also good for your muscles, as the slouched position most of us assume at our desks is bad for our posture, and can also lead to muscle dysfunction.

OLD RULE Only increase your mileage by 10 per cent a week

NEW RULE **It's OK to binge train now and again**

The beauty of cycling is that it allows you to significantly increase your training load for a short period of time with minimal risk of negative consequence. The runner who jumps from 20 miles per week to 40-50 miles per week generally ends up injured, but for a cyclist an increase from four hours per week to eight-10 hours per week should not pose too many issues.

These occasional binge weeks can be so beneficial that you should seek them out whenever you can, particularly the closer you get to your goal events. The most brutal of schedules will always offer these opportunities occasionally, so keep your eyes open and be sure to snatch them when they come your way as the occasional overload week can prompt big jumps forward in fitness.

OLD RULE Recovery drinks are for after your ride

We should all be familiar with the glycogen window, the 15-30 minute period straight after exercise when our body is best able to process food to restore glycogen levels in our muscles. But now pro level athletes are eating the recovery food even before they finish exercise. There are advantages to this; on very long hard rides it prevents your body from becoming catabolic and breaking down protein to fuel exercise, thus protecting protein stores. By taking a recovery drink in the last 30 minutes of your ride, it also helps prevent the hunger pangs that drive you straight to the biscuit tin.

OLD RULE It takes years to condition your body to ride 100 miles

NEW RULE **Start your recovery before you finish your ride**

NEW RULE

You can ride your first 100 after just six months

Old-school cyclists love to big up the challenge of cycling. Riding 100 miles, doing your first race or climbing an Alpine mountain was seen as a rite of passage and something that would take years of preparation and discipline to prepare for. Not now. You can complete really tough challenges within just six months of starting cycling, and plenty of people have done just that. Don't let preconceptions of an event hold you back; yes it will be tough but yes you can do it.

OLD RULE Record your mileage

NEW RULE

Test your functional threshold power

For nearly 100 years, our sister magazine *Cycling Weekly* published its annual mileage chart. Dedicated club cyclists up and down the land would religiously record their miles, with the belief being: the more miles the better. While tools such as Strava or Garmin Connect still record mileage and cyclists still care about their annual total, it's not really miles that count.

How many miles you have done does not reflect your fitness or your training progress. Unless your goal is simply to ride as far as possible each year then the measure you should care about most is your functional threshold power. Your FTP is a measure of your power at a point that equates with blood lactate threshold. It is one of the best predictors of performance and a clear marker of whether your training is working and your fitness improving. Regularly testing your FTP is necessary to keep adjusting your training zones to ensure that your training is as effective as possible.

CF'S DIRECTORY OF MOTIVATIONAL PHRASES

What goes through your head when you're struggling up a hill or desperately trying to hold on to a wheel? We've picked some of the best and worst motivational phrases commonly heard in cycling

There's no shortage of motivational quotes associated with sport, and a quick scroll of social media will throw up an overwhelming number of inspirational images and phrases. They are emblazoned across T-shirts, while even sportive organisers have taken to sticking up signs on tough parts of a course with words of encouragement on.

Whether a motivational phrase works or not is incredibly personal — utter the wrong phrase to someone when they are in the depths of a bad moment and you may find yourself on the receiving end of some choice language!

We've compiled a list of our best and worst quotes, but remember just because a phrase resonates with you it might not work for everyone else.

"SHUT UP LEGS" — JENS VOIGT

Talking to your legs when you ride is a disassociation technique. It also helps regain a sense of control and calm. This one from the German pro is a modern classic.

Dig in

Normally uttered in a deadpan voice to the stragglers, and is almost guaranteed to make them want to hurl their bike over the railing and retire from the race.

ALWAYS GIVE 110 PER CENT

One hundred per cent is generally enough.

NO PAIN, NO GAIN

OK fair enough, sometimes you have got to suffer during a training session to get results, but not every time.

PAIN IS TEMPORARY Glory is forever

The pain of cycling is temporary, but it's debatable whether a KoM or gold sportive finish counts as glory.

Winter miles, summer smiles

Winter training is the groundwork for a good summer season so on a wet winter's day this does get us out the door.

MIND OVER MATTER

Mental strength is often what makes the difference; however, telling someone it is 'all in the mind' when they are struggling up a 25 per cent gradient isn't likely to get a positive response.

WE ASKED

We asked you on Facebook for your best and worst motivational phrases

Georgia Mansfield: 'Go as hard as you can, then push harder' — says it all.

Greg Charlton: 'Man-up'. A terrible phrase — usually used by people who need to follow their own advice...

Ambrose Duggan: Leave nothing but tears on the handlebars.'

Nick Hussey: 'Rule five, mate, rule five.' DON'T QUOTE ME THOSE RULES!! Mate.

Jay Groom: Although a rather tainted record now, Lance's 'pain is only temporary, failure lasts a lifetime' is a cracker.

Andrew Lucas: I recently heard someone say: 'clip in and feel the burn'. Idiot.

Lee Sutton: 'Go hard or go home! IWBMATTKYT (I will beat my ass today to kick yours tomorrow).'

Mark Middleton: I like to say this to myself at the start of every ride. I think it's from *Pirates of the Caribbean*, 'Bring me that horizon'. Sounds cheesy now but it works and is a personal thing.

SECOND PLACE IS FIRST LOSER

Is this motivational? Unless you are in a position to be the winner it's not really.

HARDEN THE **** UP!

Having a little sweary moment at yourself is sometimes the only thing that gets you through a tough patch, but please don't say this to anyone else!

GO HARD OR GO HOME

If you're racing this works; there is not much point in pinning on a number and taking to the start line unless you are prepared to make it count. Riding to the cafe, well, not so much.

FEEL THE BURN

Only ever shouted by gym instructors, often at a class of middle-aged women doing legs, bums and tums. Doesn't work for cyclists.

"IT NEVER GETS EASIER, YOU JUST GO FASTER" — GREG LEMOND

This one is true, unfortunately. It's good to remember that those finishing at the back, as well as those up at the front, may be trying equally hard.

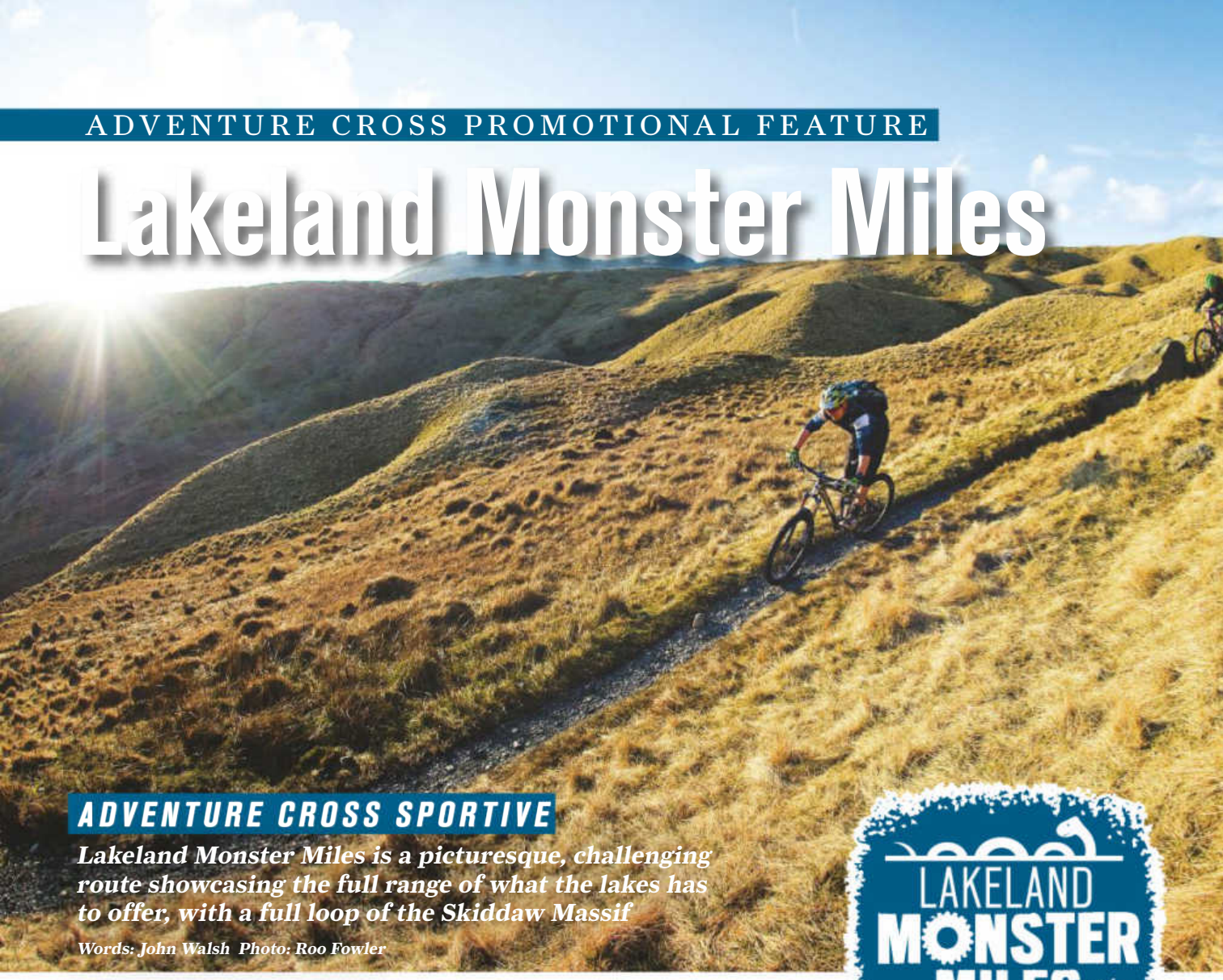
OBSESSION IS WHAT LAZY PEOPLE CALL DEDICATION

This makes the user feel slightly superior to all non-exercisers, whilst justifying their compulsive cycling habit.

PAIN IS JUST WEAKNESS LEAVING THE BODY

In some ways this is an accurate reflection of the principles of training — you suffer, your body adapts and you get stronger. Even so, this one makes us cringe.

Lakeland Monster Miles



ADVENTURE CROSS SPORTIVE

Lakeland Monster Miles is a picturesque, challenging route showcasing the full range of what the lakes has to offer, with a full loop of the Skiddaw Massif

Words: John Walsh Photo: Roo Fowler

Lakeland riding throws some unique challenges at riders and it's not just the rocks and mud that make it interesting. Now in its third year, Monster Miles is the original Adventure Cross event. Steep gradients and relentless climbing, plus a bit of typical Lakeland weather, make it a tough but satisfying day out.

The route starts from Fitz Park in Keswick. On a tree-lined disused railway the first off-road sector is a great warm-up, with a river below and occasional glimpses of distant hills a taste of the spectacular views to come. If you are lucky, bursts of golden light will be filtering through the trees as the valley starts to take on the colours of autumn. Off the old railway you are onto quiet lanes with barely any traffic as you climb up into the hills.

Both the Massif and Mini-Massif follow the same route before splitting shortly after Cockermouth with the Mini missing out a section around Loweswater and the final and highest climb of the day in Whinlatter Forest. The climb through Whinlatter is a long slog up the forest roads, and while your lungs will be burning it is soon forgotten once you start dropping down the trails, losing your hard won height on a glorious descent.

Technical challenge

Of all the Adventure Cross events this is the most technical. A highlight is the Miner's Track a wild, barren climb on an exposed part of the course. Rocky, steep and long, you may also have to contend with cross winds and will undoubtedly need to pick your lines wisely to get to the top. The fast grassy descent is an exhilarating test of bravery as you pick your line through boggy ground, willing yourself to stay off the brakes.

There is a real mix of terrain to test both your fitness and your technique. The muddy 'Bog Trotters' sector requires smooth, strong pedal strokes, while the rocky descents will test your nerve and line choice. MTB gearing will certainly help on some of the steeper hills, and a tip to anyone riding a cross bike would be to fit a mountain bike cassette and a 34-tooth inner ring for those leg-burning ascents.

Lakeland Monster Miles has rapidly earned 'must-do' ride status and, as the toughest of the lot, is a fitting way to round off the Adventure Cross season. It's not an event to take lightly if you plan on tackling the full 100km, but with preparation and determination it's a fantastic day out. It has all the components that make Adventure Cross a great experience: spectacular views, wilderness, challenging climbs and whoop-inducing descents.

WHY RIDE IT?

The original and the best. It is toughest both physically and technically of all the events, offering a full take of the best of Lakeland riding and is a great way to end the Adventure Cross year.

THE DETAILS

DATE

Sunday 4th October 2015

WHERE IS IT

Fitz Park, Keswick
Cumbria

Keswick is the popular outdoor capital of the nothern district.

Postcode: **CA12 4HS**

HOW TO ENTER

Visit **www.bookmyride.co.uk**
Entry may be available on the day if the event hasn't sold out in advance

WHERE TO STAY

The Royal Oak Is right in the heart of town and offers quality pub food for a post-ride meal. *www.royaloakkeswick.co.uk*

Harvington House. Keen cyclist and ex-tour guide from around the globe, host Graham will ensure a hearty breakfast at his B&B and some insider tips on the local trails. *www.harvington-house.co.uk*

LOCAL BIKE SHOP

The route passes no fewer than three bike shops: **Keswick Bikes, Kewsick** *www.keswickbikes.co.uk*, **4 Play Cycles, Cockermouth** *www.4playcycles.co.uk* and **Cycleswise, Whinlatter** *www.cyclewise.co.uk*.

CW difficulty rating: Technical terrain difficulty: 5/5 Wilderness Riding 4/5

MASSIF STATS

TOTAL DISTANCE- 100 KM/ 62 MILES
57% (57 KM) OFF ROAD
43% (43 KM) ON TARMAC
TOTAL ASCENT- 2465 M

MINI MASSIF STATS

TOTAL DISTANCE- 71 M/ 44 MILES
53% (37 KM) OFF ROAD
47% (34KM) ON TARMAC
TOTAL ASCENT- 1773 M

CHALLENGES

1 Circling the Massif

The long route neatly circumnavigates the whole Skiddaw Massif, with plenty of steep ups and downs, but also striking views of the mountain itself.

2 Miner's Track

Rocky, exposed and often windy, this is a grippy, technical climb that requires you to pick your line wisely and apply your power smoothly. Loose rocks make it extra tricky as they roll and bounce under you wheels.

3 Final Climb

The long climb to the highest point of the route in Whinlatter Forest is a real leg-killer. Starting off on a narrow singletrack before joining the winding forest road, it takes some concentration to survive this final hurdle.

MOUNTAIN Madness

Veteran rider *Simon Schofield* takes on his biggest ever cycling challenge, the Transalp — 550 miles over seven days, including 21 Alpine passes. Would he be up to it physically, or was he mad to even attempt it?

The email from a mate after I told him what I'd just done probably summed it up best: "Are you completely mad?" he inquired.

Given that I'd just committed to a race through the Alps sporting some terrifying statistics, his question was reasonable. Seven days. Five hundred and fifty miles. Nineteen thousand metres (62,300ft), climbing 21 Alpine passes. It's good to have a target for the season, but the Schwalbe Transalp was several steps beyond anything I'd ever attempted.

And just to add to the pressure, I'd had to enter as a team of two, from which the slower time would count. Make no mistake, this is a race — not a pleasant jaunt over the cols pausing to admire the views, savour a coffee and take a picture. OK, in theory, there's nothing to stop you doing that, but it is a timed event with rankings published daily. Coming last — and dragging your partner down into the mire of humiliation with you — was obviously not desirable. Good God, what had I done?

As I started to think through what was involved, I ticked off the positives. Experience of long Alpine climbs? Yes. I've ridden the Etape du Tour four times, the Maratona once, as well as week-long trips from Geneva to Nice and Geneva to Milan. Ability to withstand mountain weather? Well, yes. Having been caught in a ferocious storm, including landslides blocking roads, on the aptly-named Grimsel Pass; finished an Etape in 40°C on Alpe d'Huez and completed the tough ❯

Photos: Andreas Dobslaff Uwe Geissler / TOUR Transalp

Yorkshire sportive the Etape du Dales twice in vicious cold, teeming rain and howling wind, I at least know what it's like when weather goes bad. Endurance? Not bad — I usually finish a hard ride feeling strong. Time and inclination to train? Another yes — I like training. So, what's the problem?

Well, where to start? I'm heavy, at between 80 and 85kg; I can get over climbs, but not quickly. I'm getting on a bit — at 55, most of the field would be younger and they'd recover much better. I'm untested over several consecutive days of hard riding. I had no idea of how my body would react. Throw in a few unknowns like weather, logistics, mechanicals, saddle sore risk, foreign language organisation and those cold, hard stats and soon the negatives list looked a bit longer than the positives one.

This was a big undertaking. "Are you completely mad?" The question again echoed round my head.

CALM BEFORE THE STORM

The days before the start of the ride were curiously relaxing. The training's done, the weather forecast was brilliant, the bike's been checked and re-checked. There's little point in worrying; you just need to enjoy whatever the week holds in store.

Despite that, the start pen was a nervy place — exciting, but nervy. Rolling out, in the company of hundreds of others, on a neutralised start with motorbikes buzzing and the sun shining was a great moment, and stage one went to plan; I resisted going out too hard and finished in a good time. Stage two was a corker — the race was cheered on at the start by a village lined with hundreds of schoolkids and many of their parents. A mechanical intervened as I managed to break the 23t sprocket on the rear cassette but after a 30-second stop to inspect the damage I worked out I could get to the end of the day before dealing with it. I did — by

"IT'S A MULTI-STAGE RACE STARTING IN SOUTHERN GERMANY AND THIS YEAR ROUTED THROUGH AUSTRIA, SWITZERLAND AND ITALY"

Number pinned on; this is a race, not just a tour

TRAINING: HOW I GOT FIT FOR IT

A target like the Transalp is the ideal opportunity to convert a power meter from an expensive toy to a vital training aid, so I invested. It got a great deal of hammer all through winter, as I used it outdoors a little but mainly on the turbo. The fear factor engendered by what I'd committed to was a powerful motivator and most weeks I managed at least 150 miles on the turbo, riding structured sessions using Trainer Road. The aim was to raise my ability to ride longer at threshold efforts, which I figured would be helpful on long climbs. Some weeks I got up to 200 miles on the turbo. At that point, I almost lost the will to live.

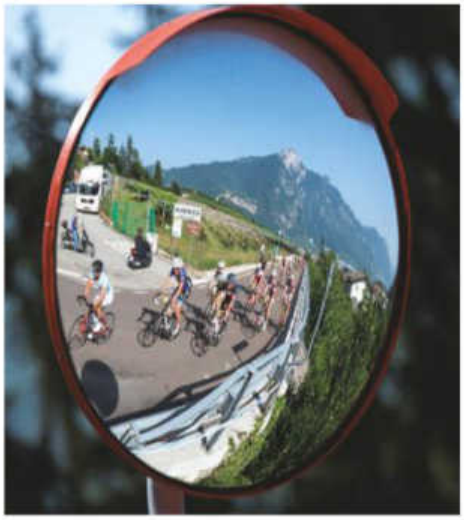
When spring eventually arrived, it was a cold and windy one. Motivation to ride outside was hard to find but I persevered. I adopted a new mantra "quality, not quantity" inspired partly, I confess, by the deeply uninspiring weather. Instead of long, one-paced rides, I opted for shorter sessions of two to three hours incorporating power-meter based intervals. I grew to almost like short, very hard efforts separated by equal periods of recovery. For the nerds, it was six times 1min at around 350w, with 1min recoveries, in sets of four or six, with 10min recoveries. I also rode hill repeats. I didn't like them at all. I averaged 200 miles training most weeks, although I did build in low-mileage recovery weeks.

A training camp in Majorca in April was an opportunity to see where I was compared with riders I knew well. Verdict: not bad. I was out-climbed by some but beat others who may have beaten me previously. Endurance was good.

But there was a problem: the training was making me ridiculously hungry and I succumbed too often to calorific treats. Healthy ones, but foods packed with calories. As a result, I avoided the scales. Big mistake.

The weather continued to be rubbish and the ambition of putting together two or three consecutive days of long hard rides fell by the wayside. I stuck to the "quality not quantity" plan, more or less kept to the mileage target, and hoped for the best. With a couple of weeks to go, I went out and pushed hard on a couple of local hills. PBs came but I was shaving seconds, not minutes. On the flat, I was as strong as an ox. The final assessment with a week to go was that I was fit but fat. I sensed I'd pay for that in the mountains. And, of course, I did.

Saving energy in a group is vital on a ride of this length



TRANSALP: WHAT IS IT?

It's a multi-stage race starting in southern Germany and this year routed through Austria, Switzerland and Italy. Think of it as seven tough sportives on the bounce run in a race format.

The route varies year to year but always starts in Sonthofen in the Bavarian Alps and ends in Arco, a small town close to Lake Garda in Italy. Every stage is hilly, some would say mountainous, with at least 2,000m of vertical ascent on the easier days and well over 3,000m climbing on the tougher days. Organisers plot the routes both for the challenge but also for the scenery, and the landscape of this year's route was stunning.

The German-run Transalp is little known in this country but it's been going for over 10 years — much longer than its perhaps better-known equivalent, the Haute Route. It's a hidden gem and deserves to be better known and ridden by more UK riders. Its history means that the organisers have sorted any teething problems and it runs like clockwork.

You enter in teams of two, although it's possible to enter as an individual and take advantage of the organiser's matchmaking service that will find you a team-mate. There are 550 teams, so 1,100 riders in total. Results are categorised by age group and gender (Men/Women/Mixed/Masters/Grand Masters) with the combined age, or gender, of the team being used to place you in the appropriate category. It's not handicapped by category. Results are taken from the team member with the slower time.

The organisers run a flawless luggage transport service between stages. You're given a huge holdall and as long as it's packed and placed in your hotel reception by 7am, it will be waiting for you at the next hotel on the route.

Roads aren't closed but marshals are everywhere and traffic is held at every junction to let the riders pass. Given that the route is largely on back roads with very light traffic, it mostly felt like a closed-roads event, although obviously great care needs to be taken on descents with no straying over the centre line. Each stage has two feed stations.

Provision is excellent with fruit, cake, energy gel pumps, water and peanuts. Despite that, it's worth carrying some food. There are medical and mechanical support vehicles and lots of motorbike marshals as well as people on junctions. There is a broomwagon. For those with energy left at the end of the day, there's a pasta party each night.

The Transalp is always held in late June. Although the weather this year was superb, the relatively early date (for the mountains) means that bad weather can strike. Last year, for instance, there were several cold, wet stages. Rain and even snow on the passes would make an already very tough event even tougher.

High passes yielded views of glaciers and summer snow fields

HOW MUCH IS IT?

Well, not cheap. Entry is €795 (with the pound strong at the moment, that's around £560) and you will need to budget around £300 for travel. If you buy an accommodation package from the organisers (this is way easier than booking hotels yourself, which is possible) it's another €500 (around £350) for a basic room with two sharing. So the total is about £1,200. You will need a little extra for evening meals, which aren't included in the accommodation package. And it's €50 to get yourself and your bike back to the start, although that may not be necessary depending on your travel arrangements.

WORTH IT?

Yes, in a word. It was impossible to fault any aspect of the organisation and it was the experience of a lifetime — the best thing I've done on a bike by some distance.

replacing the cassette at Swiss prices. Not so good. On stage three, I made a rookie error — failing to eat until over two hours into the ride. I'd been distracted by three short, hard climbs and the beauty of the route in Switzerland. But it was a silly thing to do and I paid a huge price. I took most of the day to recover, suffering badly on the feature climb, a 40km monster.

Stage four brought doubt, fear and exhaustion. I got over the first big climb — the Gavia — but in really poor shape and embarrassingly slowly. It was punishingly hot at over 37°C, and the steep, unrelenting Mortirolo almost finished me. I suffered like a dog and bad thoughts surfaced: "Were the consecutive hard days already catching up? I might just about finish today — but what about the next three stages? Could we be looking at an abandon?" I completed stage four, taking over eight hours, and dreading the following day. I had 10 hours' sleep.

The body is a remarkable thing. In the start pen for stage five, I was Mr Negative, but after an hour downhill with a warm tailwind, when I finally asked the legs to work, they did. Mind over matter? In the zone? Effective training? Who knows... but I nailed the stage and, with just two days left, I felt I was getting stronger with each passing day. And so it proved — on stages six and seven, I had my two best days and finished euphoric. I could have done another week. Maybe.

I finished top of the bottom third in my age category, which is about where I had expected to be. Positives? It was quite simply the best experience I've ever had on a bike. The organisation, camaraderie, route, weather and pride of achievement made it something I'll remember fondly for the rest of my life (as long as I block out the Mortirolo).

Things I wish I'd done differently? Being sloppy about my weight in the training period was a bad mistake in an event so dominated by climbing. 'Fit but fat' was OK, but losing 5kg would have got me, I think, to a finishing place closer to halfway up the field in my category.

Real regrets? None. It was a superb and unforgettable week.

There's a more detailed account of the ride on a blog. Search Transalp Blog on the *Cycling Weekly* website.

HIGHS & LOWS

BIG FAST GROUPS
Pelotons of up to 100 riders would form on the very few flat sections. In breathtaking scenery, on great roads, in hot sunshine it's about as exhilarating as cycling gets.

MARSHALLED JUNCTIONS
The race got priority at every junction on every stage, with traffic held as we passed. It's a bit silly, but I felt like a pro.

IN THE BUBBLE
Ride, eat, sleep, recover. There was time for little else. It sounds monotonous but a full week 'in the zone' is like nothing else I've ever done.

LANDSCAPE
Fantastic. We had lakes, orchards, vineyards, mountains, glaciers, hilltop forts, churches and gloriously sweeping roads.

THE PENS
Bathed in sunshine, but not (yet) baking hot, a huge sense of eager anticipation, a friendly atmosphere, feel-good music blaring out, the start pens dispelled nerves.

ORGANISATION
If I thought of it, they were already doing it. Beyond criticism.

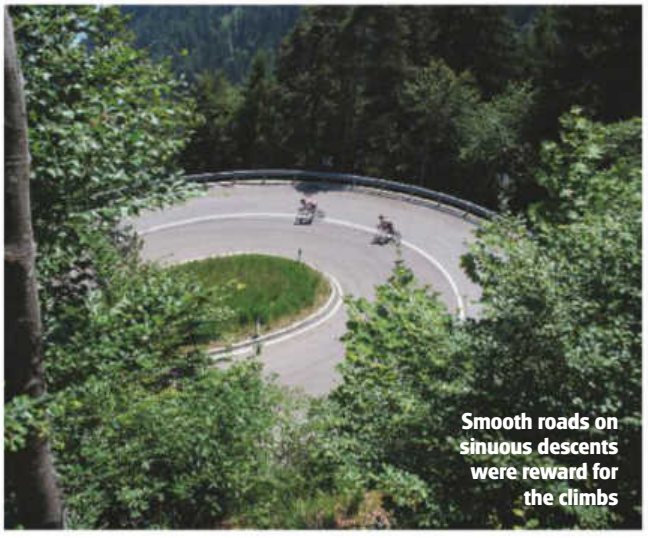
HOTELS
Some were a little way from the finish — and uphill. Not ideal.

THE MORTIROLO
The hardest two hours ever on a bike. Hot, steep, close to exhaustion, I dug very deep.

SWITZERLAND
Beautiful but insanely expensive — not the best place to have to get a rear cassette replaced in an emergency.


Italy's Trentino region provided stunning scenery with forested descents


The pace at the front was high from the gun


Smooth roads on sinuous descents were reward for the climbs

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THE COLD HARD FACTS

Sore throat? Runny nose? *Gordon Cairns* investigates the latest thinking about minimising the impact of a cold on your training routine

I am sure that I am not alone in experiencing the horrible feeling of indecision around this time of year as the colder weather approaches. I will have been looking forward to going out on my bike when I realise that the raw sensation I have been feeling at the back of my throat for the past couple of hours hasn't become any less uncomfortable and may be spreading into a head cold. Then I have to decide: will the cycle I have planned create enough positive endorphins to chase away the cold symptoms more effectively than any hot lemon remedy, or will the ride wear me out and bring on a full-blown cold?

No one is immune from rhinopharyngitis (the common cold), and the first step on weighing up your riding options is deciding whether the unpleasantness you are experiencing is above or below the neck. If your symptoms only stretch as far as a runny nose, tender throat or a sore head — and you feel that a packet of cough sweets in your back pocket will keep you functioning — then it should be fine to go out on your bike. It probably won't make you feel any worse and should give you a greater psychological boost than collapsing on the couch. I must admit I sometimes feel I can cycle away the cold symptoms before they get too entrenched within my system, although there is no medical substantiation to back this up.

However, there is evidence to suggest exercising with the common cold is harmless. A study conducted at Ball State University, Indiana almost 20 years ago, infected 50 moderately healthy 18 to 29-year-olds with the rhinovirus, the most common cause of the cold, and then divided the participants into two groups. One group of 34 exercised for 40 minutes on alternate days at 70 per cent of their heart rate while the rest did nothing. Every 12 hours the participants recorded their activities and symptoms, and had the tissues they had used weighed to calculate the severity of their symptoms. While the exercise group didn't do themselves any harm at the end of the 10 days, the intensity and duration of their illness was the same as the group who put their feet up and relaxed.

Nevertheless, it should be noted that decongestants can speed up your heart rate. Coupled with the intensity of your pedalling, this may cause difficulty breathing; so cold-carrying riders should avoid interval training sessions if they are taking an over-the-counter remedy to unblock their nose. And even if you are not, it might be wise to reduce the intensity of your riding over the week or so duration of the virus. So, leave the bike computer at home and don't try to chase down every cyclist you see in the distance.

On the other hand, if your cold has gone below the neck and alighted on your chest, you are coughing up phlegm and you feel nauseous and tired, then cycling is definitely not a good idea. Not only will you have a horrible ride, but also you will be tiring your body out instead of letting it fight the cold virus.

TO CYCLE OR NOT TO CYCLE

Dr Peter Barlow, who is reader in immunology and infection, and head of research of the School of Life, Sport and Social Sciences at Edinburgh Napier University, is an expert on influenza. Perhaps not surprisingly he says: "To be honest, I think you would really struggle to cycle if you had the influenza virus."

Even with the less severe cold virus, Dr Barlow recommends leaving the bike at home and taking public transport to work if your morning commute takes

Photos: Jesse Wild

THE DOC SAYS...

Here are Dr Barlow's tips on how best to avoid catching a cold.

- There is not a lot you can do if you are the average person who works in a busy environment, such as an office. It is quite difficult to stop yourself being exposed to the virus, so you just need to keep yourself as healthy as possible.
- Anything you can do to keep your immune system top-notch with a healthy, varied diet.
- Washing your hands frequently at this time of year is the most practical method of avoiding the cold or flu virus, which can remain on surfaces such as tables and door handles for a number of hours waiting to be spread to the next pair of hands.
- Hydration is very important in having a strong immune response; if you are dehydrated then a lot of problems can occur in your body.
- Keeping well hydrated has much broader implications than avoiding thirst. Hydration will also keep your respiratory system moist and loosen any mucus in your nose, helping to keep your airways clear.

you through heavy traffic in a built-up area: "It has been shown tiny air pollution particles are quite damaging to your lungs by themselves. But if you have a cold and cycle in a polluted area, then those air pollution particles can actually make the inflammation that the cold causes in your lungs a lot worse."

He adds: "If you are cycling in an area full of cars in the centre of town, or even on a busy street, vehicle emissions are producing a lot of air pollution particles and you are likely to be exposed to heavier pollution. One of the biggest producers of air pollution particles is diesel exhaust, so I would suggest if you have a cold, don't go cycling in polluted areas.

"If possible, ride through a city park or out into the countryside to avoid aggravating your cold."

But the good news is if you have been going out on your bike regularly, you are boosting your immune system and reducing your chances of catching a cold in the first place. A survey of 700 recreational runners found that six out of 10 reported fewer colds since taking up regular exercise, while only four per cent reported more. This anecdotal evidence is supported by a 2010 study from the United States where a group of more than 1,000 adults were followed over a 12-week period during autumn and winter. The adults who undertook aerobic exercise over the period had a 43 per cent reduction of days suffering from a cold compared with those who were mainly sedentary. The study also found that the intensity of exercise actually reduced the severity of the cold symptoms experienced. Furthermore, other research has found that even moderate exercise can boost the immune system, which although will return to the pre-exercise level shortly after the activity is over, will improve the long-term ability to fight the cold virus.

"DON'T GO CYCLING IN POLLUTED AREAS. IF POSSIBLE, RIDE THROUGH A CITY PARK OR OUT INTO THE COUNTRYSIDE TO AVOID AGGRAVATING YOUR COLD"

DOES THE COLD CAUSE COLDS?

When I was growing up my mum would always insist I wrapped up warm before going out in the winter and I was never allowed to leave the house with wet hair, all with the aim of preventing a cold. Even today many still connect the noun describing the illness with the adjective describing the temperature. On holiday this summer on the warm but windy Lisbon coast I saw the incongruous sight of road cyclists wearing long sleeved undershirts and woolly hats riding along coastal roads while below on the beach sunbathers were in their swimming shorts and bikinis.

According to the American College of Sports Medicine's current comment fact sheets: "Damp, cold or drafty weather does not increase the risk of getting a cold. According to most cold researchers, cold or bad weather simply brings people together indoors, which leads to more person-to-person contact."

In fact, if you choose to cycle on a cold and wet day, you are less likely to catch the cold than taking the bus, packed with germ-carrying humans. However, if you do have the symptoms of a cold developing, get out of your wet cycling gear as soon as possible after coming in from a ride and warm yourself up with a shower as cold germs multiply in a warm, damp environment.

Dr Barlow explains it is all a matter of association, with the uncomfortable shivery feeling of having a low body temperature and the illness we more often than not catch as the thermometer drops. "I don't know if there is any evidence to suggest that long exposure to cold temperatures can spread the virus. Bundling up may keep you warm and cosy, but it would not stop you catching the cold, unless you are covering your face with a full mask."

He does add, however, that the type of cold virus that lives in our nose is most effective when exposed to colder weather: "We perceive ourselves to be sicker in colder temperatures and certainly the rhinovirus survives better in lower temperatures. This would all add to the perception that we are more likely to catch the cold as we respond to the organism that makes you sick, which does spread a little easier when it is colder."

And because this virus likes the cold, if you have already caught the bug, research from Yale University suggests keeping warm will help fight that organism. The study published earlier this year proposes that covering our nasal passageways, while not reducing our chances of catching the cold, may help our ability to fight it. The rhinovirus causes 80 per cent of colds in the autumn, and one on five of us carry it in our nose at any one time. When the core body temperature inside the nose falls by 5° the immune system does not work as well to fight the virus, but if we keep our noses warm, then this will help our system take on the virus. So, while wearing a scarf, mask or balaclava when you are riding on your bike may not fit in with a hipster cycling image, it could be the difference between staying at home and going out on your bike. Perhaps Rapha will design a snood for next season.

In the pink: the best antidote to a cold is exercise

MOVE AWAY FROM THE COMPUTER

To be completely 'bulletproof' from experiencing the blocked nose, rasping throat and general nastiness of the common cold, then you will need to up your hours on the bike to 24 a day, seven days a week, quarantined from the human race, as the main cause of infection is other people. A study of the cold virus in offices found that 47 per cent of desktops, 46 per cent of computer mice and 45 per cent of telephones had cold viruses on them. Dr Barlow again: "Because it is spread between humans, it is not much of a recommendation to avoid human contact — although you would be less likely to catch it if you stay out on your bike I suppose, than sitting in an office!"

I am sure I am not alone in associating vitamin C with containing a cold but instead of reaching for the orange juice, us northern Europeans might be better eating some oily fish. Recent studies link a low level of vitamin D in the blood with more respiratory illnesses. In winter this vitamin is in short supply as the main source is sunlight and this has been given as a reason as to why there are more colds at this time of year.

Dr Barlow recommends: "Some people in the northern hemisphere have reduced vitamin D concentration so you might want to take vitamin D supplement."

Another factor that can increase the probability of catching a cold is your level of psychological stress. The trigger that influences a person's vulnerability to illness appears to be the immune system's sensitivity to cortisol, which may be weakened by chronic stress, allowing the inflammation that causes the symptoms to run wild. But as every regular cyclist knows, the best way to reduce stress is to escape the pressures of work or relationships and go out on your bike for a few hours to create some 'brain space'.

Finally, getting enough sleep is important for keeping your immune system healthy, especially against the common cold. A study from 2009 found that participants were almost three times more likely to catch the bug if they had less than seven hours' sleep a night compared with those who had eight or more.

5 WAYS

CYCLING *BEATS THE SIGNS OF AGEING*

Getting older is something that happens to everyone — we can't fight it or stop it, but ageing doesn't mean that we have to stop cycling. In fact, cycling can help tackle the tell-tale signs of ageing, as *John Walsh* finds

Delaying the signs of ageing seems to be the goal of every face cream and wonder food; it is certainly a phrase beloved by marketing executives. Ageing is of course inevitable and in many ways we should be glad we are ageing — it means we are still alive! However, some aspects of ageing can be slowed down. Lifestyle, diet and training changes can help us stay fit and fast for longer. Here's how cycling fits in.

1 IT BEATS THE BULGE

One of the first things people associate with ageing is getting fatter. After we hit puberty, the ageing process is typically associated with a decline in metabolic rate and therefore a reduction in the calories we require to maintain weight. As active cyclists, we can offset this decline by exercising regularly to maintain our youthful muscle and body fat percentages. The higher your muscle mass, and the lower your body fat, the stronger your basal metabolic rate and therefore the more calories you require to maintain your weight.

One of the main reasons that older people have increased fat stores is that they do less, move less, exercise less. It's not necessarily ageing, or eating more, but a sedentary lifestyle that prompts change. Keeping a high volume of exercise in your life as you age will help prevent this. Of course, when talking about body fat, what we eat is important too, with healthy eating generally being reflected by superior body composition.

2 FASTER THINKING

Having a bit of a 'senior moment' happens to all of us, even those nowhere near retirement age, as incidences of forgetfulness or confusion are quite normal. However, the condition of our brain as we age and age-related illnesses such as dementia can be improved by exercise. Physical exercise seems to be more effective than mental exercise, and mental decline is not inevitable, suggests some of the latest research.

A study led by Alan J. Gow of the University of Edinburgh published in the journal *Neurology* in 2012 showed that those who remained physically active and exercised in older age had larger brains than those who did not.

A more recent study published in the online journal *Frontiers in Ageing Neurology*, compared the blood flow to the brain, immediate and delayed memory response of subjects (age 57-75 years of age) who either did no exercise or undertook three sessions of one-hour aerobic exercise a week for 12 weeks. Those who did the aerobic exercise showed increased blood flow to the brain and improved their short-term and long-term memory.

3 IMPROVED CARDIOVASCULAR SYSTEM

Regular cycling can help prevent the changes in aerobic fitness normally associated with ageing. If we don't exercise, as we grow older our maximal oxygen uptake (VO2 max) decreases approximately five to 15 per cent per decade, beginning at 25-30 years of age. Maximal heart rate decreases about six to 10 beats per minute per decade.

This is not simply ageing but a decline in the physical activity needed to maintain fitness levels. If you keep training you can slow this decline, and studies have shown a fitness decline of just two per cent in subjects who maintained a training programme. A well-trained 65-year-old can easily be in better physical health than a sedentary person one third of that age.

Even if you start exercise later in life older adults can achieve the same 10 to 30 per cent increase in VO2 max in response to endurance exercise training as young adults can.

4 IT MAINTAINS MUSCLE

Some of the chronic afflictions that are common among the aged, including osteoporosis and arthritis, results from a loss of muscle mass and diminished muscle function, leading to decreased strength and less power. Maintaining muscle mass through sprint and weight training can help reduce or slow this down.

The American College of Sports Medicine in their current comment on 'Exercise and the Older Adult', state: "A gradual loss in muscle cross-sectional area is consistently found with advancing age; by age 50, about 10 per cent of muscle area is gone. After 50 years of age, the rate accelerates significantly. Muscle strength declines by approximately 15 per cent per decade in the sixties and seventies and by about 30 per cent thereafter."

However, continuing to exercise, and crucially, doing the right type of exercise, can slow down your slowing down.

As we age we may expect to slow down, in every area of life but especially sport. No one expects to be as fast at 60 as they were at 20, or even at 40. However, an emphasis on shorter, faster, interval-type training and resistance work can mean that you don't slow down by quite as much. Strength training can increase the cross-sectional muscle fibre area in older riders at a comparable rate to much younger ones. Numerous studies have shown that you can increase your muscle cross-sectional area with a programme of strength training even into your seventies.

Meeting your protein needs is also essential to reducing muscle loss, and scientists recognise that as our calorie requirement reduces with age the percentage of calories required from protein increases.

As we age we become less able to absorb protein so the amount we need, particularly post-training to support recovery, increases. The protein requirements of cyclists are greater than those of sedentary individuals anyway — older athletes should be looking at between 1.2-1.5g per kilogram body mass. Splitting this requirement across your regular meals will provide a constant flow of amino acids to support muscle retention.

5 IT KEEPS YOU HEALTHY

Most risk factors associated with disease increase with age. However, most of these risks can be reduced with regular exercise so the benefits of regular exercise are significant from a health perspective. Risk of cardiovascular disease can be reduced through regular exercise due to its positive effects on cholesterol levels and reduction in resting blood pressure. Maintaining favourable body composition, particularly reducing the amount of visceral fat (fat stored around the organs) is particularly important, especially in men.

In addition to reducing heart disease risk, regular exercise results in an increase in insulin sensitivity in older adults. As insulin resistance increases with age, the positive effects of regular aerobic exercise in older individuals, on improving insulin sensitivity and increasing glucose transporters, is important in the prevention of adult-onset diabetes.

Finally, because decreased bone density is more common among older adults, evidence suggests that participation in regular exercise, as long as it is weight bearing (see page 46) improves bone health and reduces the risk of developing osteoporosis, which can lower the incidence of breaks and fractures associated with falls.

KEEP IT CONSISTENT

When you see a super-fit rider out on the club run who is in their sixties, seventies or even eighties, the chances are they are they are a lifelong cyclist. One of the key things with staying fit through middle age and into old age is maintaining a consistent level of exercise.

A research study published in the *British Journal of Sports Medicine* in March 2008, showed that maintaining aerobic fitness through middle age could delay biological ageing by 12 years. It also showed a direct correlation between regular exercise and longer life expectancy. The study concluded that a regular exercise programme could slow or reverse the loss of aerobic fitness, reducing the individual's biological age.

GET YOUR FATTY ACIDS

Including omega-3 rich foods in your diet could slow down the ageing process too. Indeed, research from the *Journal of the American Medical Association* examined omega-3 fatty acid blood levels in 608 individuals over a period of five years, comparing this with changes in telomere length (another marker of biological age). Over the study period, those with the highest omega-3 fatty acid levels showed significantly less telomere shortening (a sign that the cells were ageing at a slower rate) than those with a low level of omega-3 fatty acids.

With healthy fats also thought to improve our ability to mobilise stubborn fatty deposits and some fats such as conjugated linoleic acid (CLA) helping with muscle retention too, steering clear of saturates and hunting out omega-3 and omega-6 fatty acids (with an emphasis on the former) appears to assist with health and a favourable body composition.

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BE GOOD TO YOUR BONES

Cycling is great for your leg muscles and cardiovascular system but not so good for your bones. In fact, the more you ride and depending on what you eat, says *Laura Tilt*, the more attention you need to pay to your skeletal health

Broken bones aren't uncommon among pro cyclists. In fact, they're almost a rite of passage. In this year's Tour de France, Fabian Cancellara climbed back on to his bike after a mid-Tour pile-up in which he'd broken two vertebrae — his second back injury in four months.

According to Desmond Bokor, head of orthopaedics at Macquarie Hospital in Sydney, cyclists head the broken collarbone league table — it's the classic cycling-related break, and the injury that ended Bradley Wiggins's Tour in 2011. In this context, it's easy to pass off broken bones as a natural consequence of cycling. When you're racing at high speed, slamming into a hard surface from your bike transfers a huge impact to your bones. However, a growing number of studies suggest that there could be a more serious cause underlying the prevalence of broken bones among cyclists — cycling-induced bone loss.

BONE HEALTH BASICS

To understand why biking might be bad for bone health, it's helpful to grasp the basics of bone metabolism. Just like muscle, bone is a living, growing tissue that is constantly being broken down and remodelled. During childhood and adolescence, your body lays down bone faster than it is lost, which means that your bones become increasingly dense until the age of 18-25, when peak bone mass is achieved.

Once you have reached adulthood, your skeleton undergoes a constant process of renewal: worn-out bone is removed and replaced by new bone tissue. Striking a balance between the two determines the health of your skeleton. If more bone is lost than is replaced — whether as a natural consequence of ageing, low calcium intake, lack of activity or other lifestyle factors — osteoporosis may develop. This condition results in bones becoming thin, fragile and more liable to break.

FROM BIKING TO BONE DENSITY

Read any advice on bone health and you'll learn that regular exercise is recommended for strong bones. So it comes as a surprise to find that cyclists are one group of sportspeople who are at increased risk of low bone density.

Since the Nineties, studies have been finding that Tour de France riders have significantly lower bone density than other high-performance athletes such as boxers and weightlifters. Fast-forward 20 years and numerous studies have confirmed the early indications — it is estimated that up to two-thirds of professional road cyclists are osteopenic (bone loss one step down from osteoporosis).

It's not just the professionals who are at risk. In a 2008 study comparing the bone density of recreational runners and cyclists, University of Missouri researchers revealed some worrying results. Compared to the runners, the cyclists had significantly lower bone mineral density (BMD) of the whole body. In fact, the cyclists were seven times more likely to have osteopenia of the spine, even after controlling for other factors such as age, weight and diet. ›

Photos: Chris Catchpole, Andy Jones


LAZER
S-WORKS
SPECIALIZED

"I regularly see cyclists who have low BMD in my clinic," says Dr Rick Seah, consultant in sport and exercise medicine at the Institute of Sport, Exercise and Health in London. "Often, it is picked up when they have had a musculoskeletal injury — for example, a stress fracture — and we carry out screening to see if they are at risk of osteopenia or osteoporosis."

Low bone density might be associated with older age, but it isn't a concern only for older cyclists. In a 2009 study from the University of Oklahoma, researchers studied the bone density of recreationally active male road cyclists, aged around 30 years, who trained for seven to 22 hours a week. They compared the results with a group of age-matched controls and found significantly lower bone density in almost all the spines of the cyclists. In fact, 25 per cent of the cyclists were classified as osteopenic, compared to just 10 per cent of the control group.

Dr Rick Seah, musculoskeletal & sports injury specialist

"Cyclists can be at risk of low bone density for many reasons, including dietary deficiencies and poor diet. For protective reasons, cyclists wear clothing that covers a large surface area of their body and prevents them from getting sunlight, which is necessary in order for the body to produce its own supply of vitamin D, an essential component of bone health."

Studies in female cyclists reveal similar findings. Last year, US researchers followed a group of female cyclists over the course of one year of training, involving at least 10 competitive events. Over the 12 months, bone density was significantly reduced across the thigh, hip and spine despite no change in body weight or composition. Like it or not, low bone density is an issue for cyclists. The question is, why?

THE BONE DENSITY CONNECTION

Cycling is celebrated for being a non-weight-bearing exercise, but it's this quality that makes the sport less than ideal for bone health. Bones need to be stressed with a mechanical load to trigger the formation of new tissue, and cycling, unlike running or weight training, puts little strain on the bones.

In fact, cycling minimises stress on the skeleton because the bike supports body weight. Road cyclists in particular do little to stress their bones, concentrating on endurance sessions. The repetitive nature of training can lead to more bone breakdown than bone formation.

A 2009 study following competitive cyclists over the course of a race season showed that the riders experienced a significant loss of bone density in their hips. Three months later, scans revealed the bone density had not yet recovered. Further clues come from the fact that mountain bikers have been shown to have higher bone density than road cyclists — because mountain biking involves more impact on bones, as a result of bumping across uneven terrain.

According to Pam Hinton, associate professor of nutritional sciences at the University of Missouri calcium losses and high-volume training also play a role. "Cyclists, especially competitive road cyclists, spend many hours training. They have greater sweat volumes than other athletes and, therefore, greater calcium losses," she says.

Up to 200mg of calcium — the amount found in a glass of milk — can be lost per hour under intense conditions. Multiply this by the number of hours of training per week, and the numbers quickly add up. Blocks of intense training also affect hormones that determine rate of bone turnover. "High energy expenditure because of large training volumes can cause decreases in the sex hormones, oestrogen and testosterone, as well as growth hormone and insulin-like growth factor," reports Hinton.

DIETING DOWNFALL

The low body weight demanded by competitive cycling is another issue. Lighter riders tend to have the lowest bone density, and the extreme dieting practices that are employed can lead to low intakes of calcium and vitamin D — vital nutrients for bone health.

The popularity of dairy-free diets among cyclists following low-fat diets can also result in low calcium intakes. If you don't get enough calcium from your diet, your body will simply steal it from your bones to make up the deficit.

PROTECTING YOUR SKELETON

The threshold of cycle training that increases the risk of low bone density isn't clear, but the more time you spend on your bike, the more important it is to adopt habits that protect bone health, especially if cycling is your main form of exercise.

The first step is to start including some weight-bearing activity two to three times a week, whether that's a strength-training programme, running or even walking. A study published by Hinton and her team found that both weightlifting and jump-training effectively improved bone density in men with bone-density low scores. As a bonus, weight-bearing activity promotes muscular strength, which protects the bone and reduces the likelihood of trips and falls that can lead to fractures.

Introducing more high-intensity sprints to your rides is another way to reap similar benefits. Sprint cyclists have been found to have higher bone strength in their legs than endurance-trained road cyclists, thanks to greater muscular load.

Healthy adults should eat three servings of dairy a day to get their recommended calcium intake

TWEAK YOUR DIET

Once you've got the weight-bearing activity sorted, it's time to take a look at your diet. The recommended intake of calcium for healthy adults is 700mg a day — the amount found in around three servings of dairy, but that's before sweat losses are accounted for.

The calcium from dairy is easily absorbed by the body, so if you don't have a health reason to avoid dairy, don't. Leafy green vegetables might be touted as a good source of calcium, but they also contain substances that actually reduce calcium absorption — around five per cent of the calcium in spinach is absorbed, versus 30-35 per cent from cow's milk.

Lactose-free milk is the best option for the lactose-intolerant; it contains as much calcium as regular milk. If you follow a

dairy-free diet, opt for plant milk that is fortified with calcium, and ensure adequate calcium from other dairy-free sources.

Recent research also shows that a calcium-rich meal eaten before training may improve calcium balance and reduce bone resorption (breakdown) that results from repeated training.

In a study published earlier this year in the journal *PLOS One*, well-trained female cyclists performing 90-minute cycling trials on consecutive days consumed either a calcium-rich dairy meal (containing 1,350mg calcium) or a control meal (46mg calcium) two hours before exercise. The results showed that the markers of bone resorption were around 1.5 times lower in the group who consumed the calcium-rich meal.

It's also important to consume adequate vitamin D, which is involved in calcium absorption. Low levels of vitamin D are common during the winter due to poor sunlight exposure, so it's worth considering a supplement, especially during the cold months. Food sources of vitamin D are limited to oily fish, eggs or fortified foods. If you're worried about your vitamin D levels, it may be worth consulting your GP or buying a home test kit (City Assays in Birmingham offers a postal service with emailed results for £28).

"If a cyclist is at increased risk for osteoporosis, for example family history or prior fractures, a check of hormone levels might be warranted to correct any issues that might contribute to bone loss," says Hinton.

8 STEPS TO BETTER BONE HEALTH

1 LIFT SOME WEIGHT
Weight-bearing exercise is essential for new bone formation. Experts at the Bone and Joint Injury Prevention and Rehabilitation Centre in Michigan found the best bone-building exercises included jumping for the lower body, and racquet sports such as tennis for the upper body.

2 DON'T FORGET TO REST
Consecutive days of road cycling can increase bone resorption (breakdown). Rest periods are vital to stimulate bone growth — so mix up your training with weight-bearing exercise and include downtime.

3 EAT CALCIUM-RICH FOODS
Calcium from dairy foods is readily absorbed, and the protein-rich content of milk and yoghurt makes them ideal for cyclists. Milk is effective for post-workout recovery thanks to the mix of protein and sugars, plus it replaces calcium and sodium lost in sweat.

4 GET SOME SUNSHINE
Calcium can't be absorbed without the help of vitamin D. Ninety per cent of our vitamin D is obtained from sunlight exposure, so aim to expose hands, arms and face for 10-15 minutes a day from April to September, and consider a supplement come winter.

5 MAINTAIN A HEALTHY WEIGHT
Low body weights and fad diets are bad for bones. Being lean is fine, but avoid extreme dieting practices or unnaturally low body weight.

6 DON'T SMOKE
Smoking is bad for your health and bad for your bones. Enough said.

7 BAN BINGE DRINKING
Excessive alcohol interferes with calcium absorption and heavy drinking has been associated with an increased risk of osteoporosis.

8 CONSIDER A BONE DENSITY SCAN
If you have a family history of osteoporosis or have frequently suffered fractures, speak to your GP about whether you need a bone scan.

RIDE MORE, BECOME HAPPIER

Regular riding isn't just about becoming physically fitter — it may also improve your mood and make you happier and more productive for ever

Feeling happy and having a greater sense of well-being is the holy grail of modern society. A significant number of self-help books have been published, films made and, yes, even magazine articles devoted to how to be happy. It's a goal that everyone can relate to; who wouldn't want to feel happier?

Research shows that there is a positive relationship between workers' stable happiness and their work performance (Wright & Staw, *Journal of Organizational Behavior,*1999). People in positive moods have been shown to be more creative problem-solvers (Isen, *Handbook of Emotion*, 2000) — so it is something our employers should want for us too.

Finding things that increase our happiness levels is for many of us an ongoing search, or at least something to daydream about. Unfortunately our stable level of happiness is more resistant to change than we might imagine. While mood might go up or down slightly on a daily basis, our baseline level of happiness and well-being shifts very little. Even big, life-changing events that you think might make you happier, such as winning the lottery, apparently has no lasting effect (*Journal of Personality and Social Psychology*, USA, 1978).

"BIG, LIFE-CHANGING EVENTS DO NOT IMPROVE LONG-TERM HAPPINESS, WHEREAS CYCLING EVERY DAY DOES"

ROOM WITHOUT A ROOF

So, is our search for happiness destined to be fruitless? Are we just the way we are? Can nothing change us?

"Money can't buy happiness but it can buy a bike," so the saying goes. As bike riders, we all know that cycling makes us feel good, and riding regularly could do for you what winning the lottery can't — shift your happiness baseline up a notch or two.

Research published in the *Journal of Economic Psychology* in 2008 took a new look at how to increase happiness and well-being. In response to the finding that major life events such as winning the lottery, getting a new job or getting married don't have a lasting effect on happiness, they looked at smaller, daily life events.

"We suggest that the cumulative impact of repeating minor but positive life events in the short-term — such as choosing to work out several days a week — may be sufficient to increase well-being in the long-term."

By surveying people before and after their attendance at a yoga or gym class, they were able to determine that exercising created a small boost in participants' feelings of happiness and well-being. The more frequently the sessions were attended, the higher was the overall measure of well-being.

"Our findings imply that it is not pointless for people to seek to improve their well-being," commented one of the researchers. "However, improvement may not come from major events such as winning the lottery, despite the seemingly life-changing nature of such examples.

"Rather, it seems like the key for long-lasting changes to well-being is to engage in activities that provide small and frequent boosts, which in the long run will lead to improved well-being, one small step at a time."

This may seem obvious to those of us who love riding our bikes, but when it's wet, cold and miserable outside and you feel tired and miserable, it is worth reminding yourself of the uplifting effects. Getting off up the sofa and out the door can seem too much of an effort, but it's worth it; getting out on your bike regularly is one of the few things that could make you feel happier in the long term.

Benefits of commuting by bike

If your employer isn't supportive of cycling and needs a bit of persuasion to provide facilities, then it's time to let them know that more employees cycling to work could save them money.

Cycling charity Sustrans has released new statistics that show riding to work could halve the number of sick days and provide a £13.7bn annual boost to British businesses. Cyclists take two days fewer sick leave a year than people who don't cycle.

Absenteeism costs UK employers £258 per day, with the average worker taking 4.5 sick days per year compared to just 2.4 days among cycle commuters.

A short ride will do

Feeling tired? Lacking energy and inspiration? A potent solution is to go for a short ride. Fitting in a quick lunchtime ride could be just the thing to boost your productivity.

A study in *Psychotherapy and Psychosomatics* found that cycling reduced feelings of fatigue by 65 per cent and boosted energy by 20 per cent — a far healthier fix than that extra-strong coffee and chocolate muffin!

Photo - Phil O'Connor

WE ASKED

Does cycling make you happy?

Si Ellis: "Yes, unequivocally. Nothing can touch a good day out on the bike for happy juice."

Barry Mann: "I kid you not, my wife said I seemed a lot happier after I started commuting to and from work by bike. And the Saturday club ride sets me up for the day."

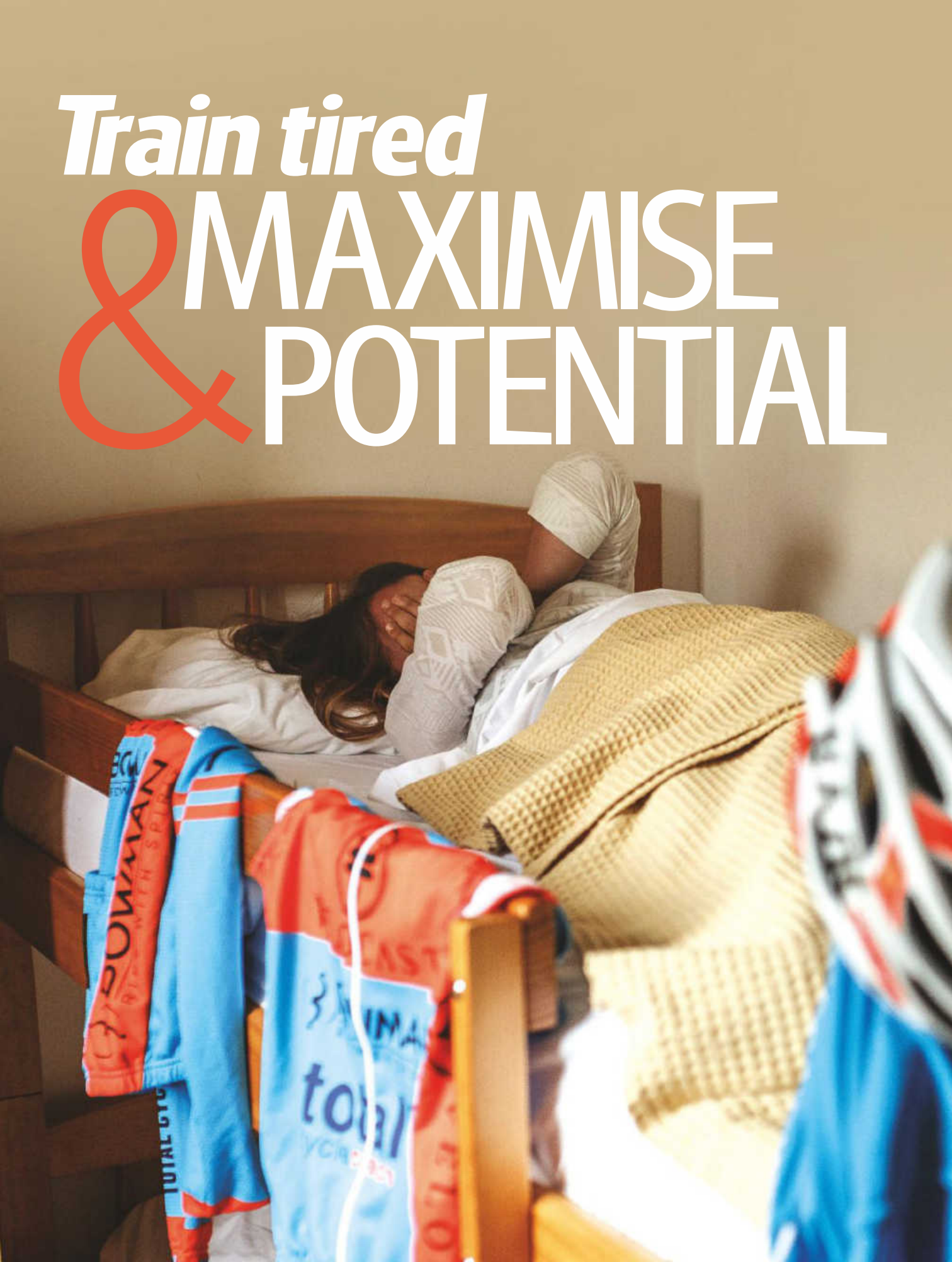
Tom Colunga: "Cycling makes me feel alive. It steadies my mind and keeps me going. If that qualifies as being 'happy', then that's exactly how cycling makes me feel."

Christine Brown: "Yeah... best ever feeling riding through the forest and being so free to do just that."

Fred Dyer: "I thought about this last night as I was looking for those last few finishing parts for my new dream build. I said to myself: 'Will all the money I have spent on this make me happy?' Then I slapped myself; of course it will!"

Nancy Baumann: "I have been active since I could walk, and there's something about the road bike which can't be compared to anything. I call it my 'meditation on wheels' time and I wouldn't trade it for anything — it fixes everything!"

Train tired & MAXIMISE POTENTIAL



Most of us strive to perform at our best in every session, but training tired may be the necessary hard slog we need to stimulate adaptation and improvement, argues *Dan Henchy*

There's no better feeling than being fit, fresh and at one with the bike, when speed comes effortlessly. Perhaps more familiar, though, is the sensation of tiredness, feeling not fully recovered from the previous ride, lacking energy and stuck to the road. From an enjoyment perspective, we have every reason to strive for the first scenario every time we jump on the bike. However, if you're looking to break through to a high level of performance, it might be necessary to expect or even plan to experience the second scenario on occasion.

It is vital to have a clear aim for every training session in order to benefit optimally from your time on the bike. Therefore, you need to decide whether that aim is adaptation or performance. If the aim is adaptation, you do not necessarily need to be at your best (most powerful or fastest). Big improvements can from result from sessions completed while tired. If performance is the aim, it probably pays to train in a well-recovered state.

The innovators (and marketers) at the cutting-edge of cycling science bombard us with methodologies and products designed to improve our performance. Sometimes, though, these protocols are followed at the expense of adaptation.

FATIGUE VERSUS FRESHNESS

When we do a training session, we get tired, and the adaptive response of the body is to improve in a way that makes us better equipped to deal with that training session the next time we attempt it. This is what is meant by adaptation.

As a novice cyclist, it's possible to make adaptations with every ride. A single training session with a little recovery is sufficient stimulus to cause us to get fitter. However, as we get stronger and more experienced, one training session might not be enough. Instead, we need to string together two or three sessions, or even a week of training to put enough stress on the body to stimulate a fitness improvement.

At the elite level, one week might not be enough — moving on from an already high level of fitness might require training blocks lasting several weeks, or even several months, to trigger the necessary adaptations.

This leads to a dilemma for many athletes. Everyone wants to perform at their best all the time and always feel great on the bike. But at times, in order to improve, it's necessary to train while carrying some fatigue — while your form is not at its sparkly best. After training for a few years, improvements grow harder to come by.

It's important to determine the top priority: training load or performance. There's nothing wrong with feeling tired during some sessions, as long you rest up in time for your event or race. This can be the key to busting through plateaus in fitness that plague every rider at some point in their riding career.

FUELLED VERSUS DEPLETED

Proper fuelling is vital to performing at your best. The top teams in the Tour de France travel with nutritionists, chefs and mobile kitchens to ensure they can adequately match the calorie requirements of riding at the highest level. High-intensity exercise is heavily reliant on carbohydrate metabolism; it has been proved that feeding with carbs during exercise can increase performance.

However, research suggests that training while in a carb-depleted state may provide a greater stimulus for fitness improvements and greater reliance on fat as a fuel in place of carbohydrate.

Mindful of the conflicting advice in this area, should you consume lots of carbohydrate or limit your intake? The answer depends on the priority of your training session — and pivots on our adaptation-versus-performance dilemma.

If adaptation is the primary goal, training with low carbohydrate may be a good choice. However, for newer riders, the training session alone is normally sufficient stimulus. The closer you get to race day, and certainly on race day itself, an increase in carb intake is important to enable you to perform at your best. Ask yourself: what nutritional approach will best support the aims of this training

Photos: Jesse Wild

session or training block? Training in a depleted state is a fairly advanced strategy, so if you have any doubt, fuelling your training is generally a good strategy to protect the quality of your workout. A qualified sports nutritionist or experienced coach can help if you're unsure.

ANTI-INFLAMMATORIES

In recent years, a trend has emerged in favour of foodstuffs and supplements with anti-inflammatory or anti-oxidant properties to aid recovery. The body has an inflammatory reaction to the stress of exercise, and substances such as cherry juice, vitamin C and ibuprofen have been suggested as means of reducing this inflammation and enabling you to recover faster and train again sooner.

However, the inflammatory response is now understood to be a crucial part in triggering adaptation. Reducing this inflammation using, for example, cherry juice may also diminish the trigger for your body to get stronger or fitter.

On the other hand, when you're in the final week before a big event, or trying to recover between stages, adaptation is less important than minimising fatigue — so anti-inflammatory strategies come into their own. Think carefully about the unintended consequences before you add a new supplement to your regime, or seek expert advice.

SPECIFICITY

Another case of confusion when it comes to adaptation versus performance is in the case of training specificity. An important concept when it comes to training adaptation is that the fitness improvements you accrue are specific to your training. Five-hour rides won't necessarily help you squat 200kg, and vice versa.

If you follow this principle to its logical conclusion, you might wrongly assume that your training should always be similar in effort and duration to your racing. Training must be physiology-specific as well as event-specific.

To illustrate this concept, recent research has examined the role of very short but very high-intensity training on endurance performance. Studies have shown that sprint training sessions can trigger adaptations, at a cellular level, similar to traditional endurance training. Doing 6x30sec as hard as you can with four-minute rests between each can be just as effective as one hour moderately hard for improving endurance performance.

It's not immediately obvious that 30-second intervals would be effective for, say, a 10-mile time trial, but the session stimulates improvement in a relevant facet of your physiology. Once again, focus on the intended improvement and look at a training session that specifically addresses that aim. Sometimes this means thinking outside the box.

"WHEN WE TRAIN, WE GET TIRED. THE ADAPTIVE RESPONSE OF THE BODY IS TO IMPROVE IN A WAY THAT MAKES US BETTER-EQUIPPED NEXT TIME"

Training while fatigued is not only inevitable, it's essential

Some sessions require full-on carb fuelling

LONG-TERM PLANNING

With all of the many factors and decisions involved in training, how do you know where to start? On any single day, it's impossible to know whether you should rest or train — and which recovery supplements you might need. Even once you've decided to take on a session, it's hard to know whether to aim for a steady endurance ride or some high-intensity intervals, and how to fuel that workout. Where do you start?

Often, there is no firm right and wrong answer. What is important is that your decisions match the context; namely, where you are in your training year and the nature of your goals. The only way to get these decisions right on a consistent basis is to develop a long-term plan and identify the key priorities at each phase of the year. For example, if your aim is to increase your sustainable power in order to ride up Alpe d'Huez or race a 25-mile time trial, you could do a lot worse than organising your training along these lines:

ENDURANCE (12 WEEKS)	TOP-END FITNESS (4 WEEKS)	SUSTAINABLE POWER (8 WEEKS)	TAPER AND RACE (2 WEEKS)
Focus on building training load with low-intensity riding, OK for a little fatigue with back-to-back rides	High-intensity intervals to lift maximal aerobic power	10-20min blocks at max sustainable power and 5-10min blocks just above this level	5-10min blocks at max sustainable power, reduced volume but maintain intensity
Some fasted rides, building in length	All rides fully fuelled with carbohydrates to enable high intensity	Key sessions using carbohydrate, option of additional fasted endurance rides for further stimulus	Anti-inflammatories added to boost recovery
Physiology-specific	Physiology-specific	Event-specific	Event-specific

This is in no way a recommendation for how to organise your own riding, but it highlights certain key principles. For example, this rider would make use of both physiology and event-specific types of training, have periods of the year when some sessions are done tired, and change their fuelling to best support the aims of the training. The only way to keep track of these aims is to spend some time building a long-term plan:

- Start with the end goal. Work out what it takes to do well in your event and put the most event-specific training in the final weeks leading up to the event.
- Establish where your fitness is now and highlight those areas of your physiology that need improvement in order to enable you to complete the specific training at the end of the plan.
- Decide which training will help you achieve the aims you have at each stage.
- Add in a plan on the other aspects of your preparation, such as the optimal nutrition to support the aims of your training at each stage.
- When it comes to deciding when to train and what to include in your bike sessions, there are no definitively right or wrong answers. The only way to judge whether your choices are the best for you at that particular time is to write a long-term plan; refer back to the plan whenever you're not sure. A little planning can make the difference between a frustrating plateau or continued progress towards your goals.

5 WAYS TO KEEP YOUR WATER BOTTLES CLEAN

You use your bottle every time you ride so don't let bacteria build up inside it

If you use energy drinks, or even squash, to flavour the water you take on your ride, then it is definitely worth taking a few minutes of your time to sterilise your water bottles occasionally. Unhygienic bidons, particularly when on a multi-day trip, can lead to funny tasting drinks at best and an upset stomach at worst.

We've all been guilty of leaving a bottle on a bike or in a kit bag to go mouldy at some point. The lovely sugary goodness in the bottom of the bottle is the perfect breeding ground for mould and bacteria. As such, empty and rinse the bottle with warm, soapy water as soon as you finish your ride, and use a bottle brush to get right to the bottom where the sticky energy drink solution is hard to rinse out.

Don't forget to squirt clean water through the nozzle of the bottle as this is a prime spot for gunk to build up from the inside, and the cap can get covered with all sorts of road muck and grime on the outside.

→ BAKING SODA

Baking soda is cheap and most of us already have some in the cupboard. Not only does it clean but it also deodorises, getting rid of the plasticky smell new bottles have, and it helps keep the flavour of your water fresh. Just drop a teaspoon of baking powder into your bottle, fill with water, shake and leave to stand. Rinse before using again.

→ DENTURE-CLEANING TABLETS

Drop one of these into your water bottle, fill and leave to stand to get rid of stains, bacteria and mould. You can buy tubes of individual tablets in large supermarkets or chemists. These are convenient to carry in a kit bag if you are away on a training camp or stage race, so even when in a hotel room you can give your bottles a thorough daily clean.

→ STERILISING SOLUTION

A sterilising solution such as Milton — as used for babies' bottles — will obviously do the same job on a cyclist's water bottle. You can easily do a batch of several bottles and the lids, which can get really gunked up, by submerging them in the solution and leaving them to soak. Use at the right concentration, read the label and bottles don't need rinsing after sterilising — just leave them to air dry.

→ DISHWASHER

It's quick and easy to stick your bottles in the dishwasher but it's not always totally effective if the jet sprays don't reach the bottom of the bottles. A hot wash will help kill bacteria but can also distort the shape of the bottle and wash off the markings and logos. This is a fast method but don't expect your bottle to last for long.

→ FREEZER

Keeping your bottles in the freezer doesn't kill microbes or bacteria completely but it will certainly help to stop microbes growing inside your bottle. That way, when you go to use them they will be clean and fresh-smelling, however long it's been since their last wash.

Photos: Jesse Wild

2015 AUTUMN PULL-OUT TRAINING GUIDE

It may be approaching the end of the season but now is the time to use the fitness acquired over the summer to push your performance forward

Heading into autumn is a great time to assess where you are with your riding, what you want to achieve next year and set some goals. Late summer is when most of us feel our fittest, so it's a good time to take stock of where you are physically with a basic performance test, such as that included at the front of this training guide. Instead of letting your summer fitness slide backwards during autumn and winter this year, see it as a jumping-off point for greater improvements next year.

Cycling performance is becoming increasingly number orientated. Power meters, fitness testing and a monitor on every handlebar give us unprecedented amounts of data to scroll through. However, it's good to occasionally keep it simple, and nothing could be more simple than the goals of our first two plans: break the hour for a 25-mile time trial or ride 100 miles in under five hours. These are time-honoured 'gold standards' of cycling, tough but achievable goals, and training for them will benefit your all-round cycling performance.

Our final plan is dedicated to 'getting you round'. Cracking your first 100-mile event is a cycling rite of passage; the first step might be a metric century, 100 kilometres, but a true century is measured in miles. If you want to step up to the epic distances ›

PLAN 1: FITTER
Cycling has a number of breakthrough moments; the first time you ride 'evens' (a 20mph average for 10 miles) or the first time you conquer a 100-mile ride. Riding 100 miles in under five hours is another key fitness goal. It's not easy but the finishing times in this year's Surrey RideLondon 100 testify to the fact that it is a realistic target for many.

PLAN 2: FASTER
Getting under the hour for a 25-mile time trial has always been a key performance mark that club time triallists aimed for. It has once again become a popular with the resurgence of interest in the Hour record. Training for a 25-mile time trial will improve your functional threshold power, defined as the best effort you can hold for an hour.

Photo: Jessie Wild

then the first step is developing a good solid endurance base. Most sportive organisers set three distances and increasingly the longest distance will be touching or exceeding the magic 100-mile mark. For many riders it is clocking the miles, and going further than they have before, that excites them, rather than going faster.

Your autumn training plans should be attached between these two pages. If they are missing, please contact us to receive a replacement.


Fitness FURTHER PLAN

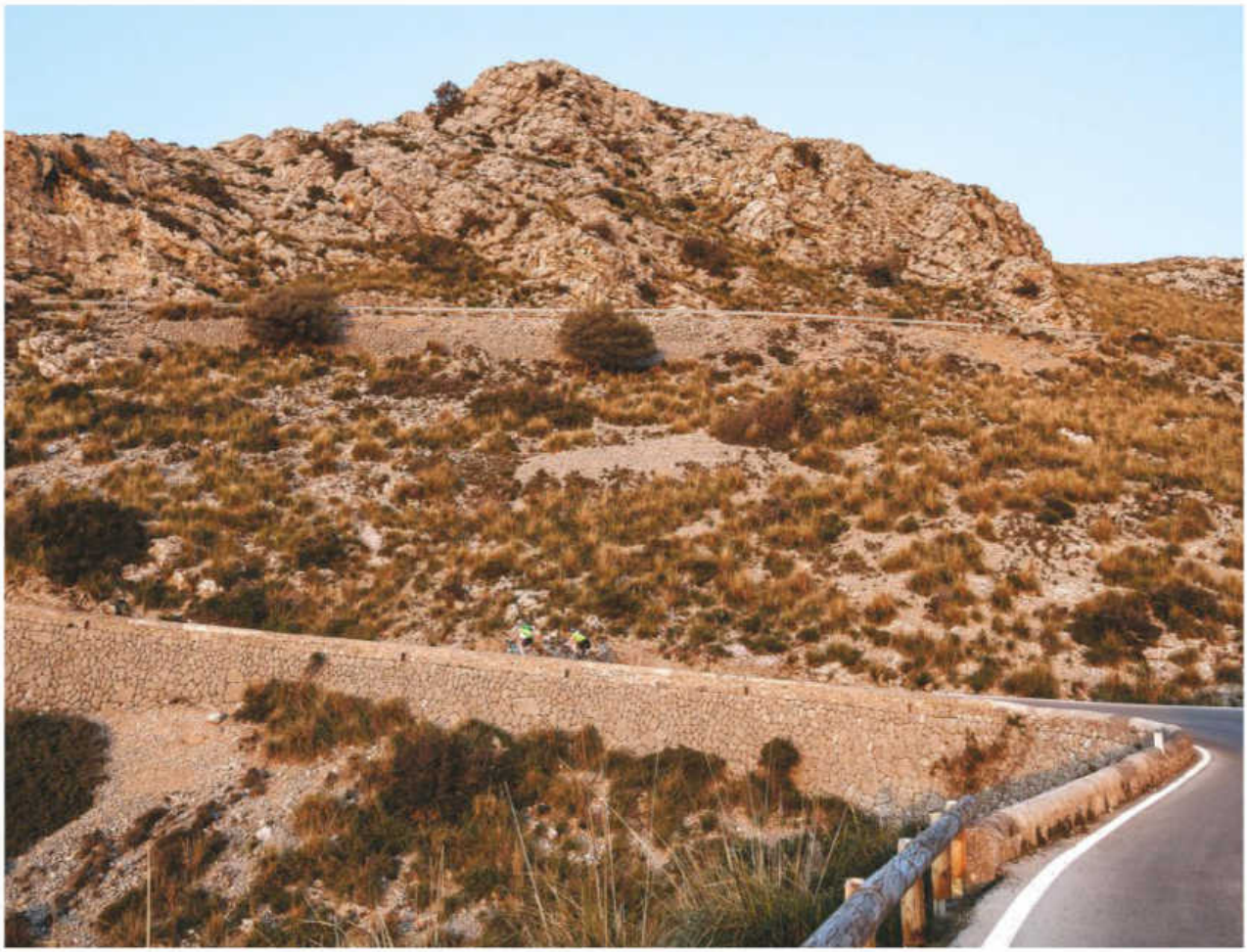
Ride your first long sportive

KEY SESSIONS

THIS IS THE PLAN FOR YOU IF...

PLAN 3: FURTHER

When tackling a long-distance event for the first time it is not speed that worries most riders, it is more likely to be: can I complete the distance? Stepping up to the full-length of epic sportives, many of which are over 100 miles, requires you to have both good endurance and to be comfortable in the saddle for several hours.



2015 AUTUMN PULL-OUT TRAINING GUIDE

TESTING ONE... TWO... THREE...

You may feel fit, but without the data to back it up, how do you know for sure? A fitness test gives you solid evidence to quantify your form — and a benchmark for your training. *Simon Schofield* evaluates the different types of test available

As the days gradually shorten and the season draws to an end, now is a great time to get your performance tested. There's plenty of excellent riding left to be done during autumn, but the chances are that, with a good season in the legs and all your biggest events done, you are now at or close to your fittest and strongest.

Benchmarking yourself now is a useful exercise. If you can get one single number for your overall fitness, you can use it to inform your work over winter and to start to plan next year's training. It also gives you a number to beat when you repeat the test next year — and there's nothing quite like an objective target to keep motivation high.

HOW TO TEST YOUR FITNESS

Fitness tests range from the cheap and cheerful to those used by the pros; the good news is that all types are accessible to amateurs too.

Getting tested using a power-meter-based system is more accurate and provides a better guide for training. That said, heart-rate-based testing is almost as good. Here's all you need know about the three testing methods.

STRAVA'S FITNESS AND FRESHNESS

You need to be a Premium member of Strava to access this guide to your fitness. It equates your fitness to one simple number, using either heart rate or power or a combination of the two. It is a very useful method of tracking fitness over time, provided you're diligent about entering all your rides on the platform. It records how long and how hard you ride and uses a version of a metric called 'Training Impulse' to map how this translates into fitness. Riding long and hard gives you a high score; short and easy, a low score. The higher your score the fitter you are. It's nice and simple but not especially sophisticated and not a particularly useful tool for planning a programme. It's more a fitness snapshot and tracker.

FUNCTIONAL THRESHOLD POWER

An FTP test gives you two very useful results. One is an accurate snapshot of where you are in terms of your fitness and the other is a metric that allows you to plan how to improve. It's best used in conjunction with a power meter but it's perfectly acceptable to use heart rate as an alternative, and testing can be done outside or inside on a turbo.

There are lots of protocols available and search online for these, but ›

Photos: Jesse Wild, Chris Auld, Neil Hendry


GARMIN
ULTEGRA
ULTEGRA

essentially an FTP test entails pedalling as hard as you can sustain for 20 minutes. It's important this is done after a good warm-up, and the number it produces, either in watts or heart rate, is your estimated maximum sustainable pace over one hour. FTP is very trainable — that is, it can be improved with structured programmes using training zones. You can use FTP as a training guide without a coach as long as you read up and understand some basic sports science. A coach takes away some of the theory — but you still have to do the practice.

VO2 MAX TESTING

Of all the figures and measurements available to cyclists, VO2 max is the most valuable. It's widely accepted as being the best single number to measure the kind of fitness that is important to going fast on a bike — cardiovascular condition and maximal aerobic power.

VO2 max is generally expressed as either litres of oxygen per minute or, more commonly, millilitres of oxygen per kilogram of body mass per minute. The ml/kg/min is much more widely used and it's this figure you may see when reading about Grand Tour riders.

Some elements of VO2 max are genetic, leading to the famous quote from fitness pioneer Professor Per Olof Astrand: "To be an elite athlete, choose your parents carefully." VO2 max is trainable to a certain degree, however, and it can be improved markedly even as you age.

My experience is a case in point. The last time I got a VO2 max test was at age 45, around the time I took up cycling seriously after a long break. My results then were 42ml/kg/min — the high side of average compared to the general population but not spectacular.

After a recent test (see box) the news was better: I'd tested at 53ml/kg/min. For my age, that is excellent when compared to the normal population and when compared to competitive cyclists, it rates my potential as a cat-two racer — my potential, not actual, performance.

To translate potential to performance still requires an awful lot of training. But 10 years of riding — none of it particularly structured — had raised my VO2 max by around 20 per cent. And it can be improved even further.

To do that, the training needs to be structured and time needs to be spent working at the 'top end'; that is, short bursts repeated as often as you can tolerate at the upper limit of your power outputs. Hello, hill repeats; hello, short, fast bursts of one minute on, one minute off.

A VO2 max test, along with a training programme devised by someone who is able to interpret and implement the findings, is an excellent way of both discovering and tracking fitness and deciding how to design and schedule training programmes.

VO2 MAX TEST: TAKING IT TO THE LIMIT

No one has ever woken up and thought, "I'm really looking forward to my VO2 max test today." You may be interested in the result, but the process is, well, painful.

Essentially it involves pedalling like stink until you're on the point of collapse, gasping for breath, sweating like a pig with your quads burning like the fires of hell. And it'll cost you north of £150. Apart from that, it's great. The fact it is mercifully short is perhaps the only upside, apart from the data, which is liquid gold if you're serious about finding the shortest route to big gains from targeted training.

It's vital to go into your VO2 max test in a well-rested state, which I failed to do. I turned up for mine and, after a chat with physiologist Craig Stevenson at Performance Sports Consultants, we decided to postpone the test for a week. I was tired after a tough few days' riding and had not recovered enough. After some gentle probing from Stevenson, it became obvious that the data would be unreliable and so there was no point in testing.

Not all testers will be as diligent — so if you invest in the test, rest beforehand. At least 48 hours off the bike and an easy week before the test should do the trick.

COLD COMFORT

A week later, I was ready. Stevenson's lab was cool — around 16°C — which is ideal. In addition, he had a meaty fan installed in a prime position. Temperature is very important because one of the

A VO2 max test is torturous but very informative

Normative VO2 max values - general population						
MALE	**AGE: 18-25**	**26-35**	**36-45**	**46-55**	**56-65**	**65+**
Excellent	> 60	> 56	> 51	> 45	> 41	> 37
Good	52-60	49-56	43-51	39-45	36-41	33-37
High Average	47-51	43-48	39-42	36-38	32-35	29-32
Average	42-46	40-42	35-38	32-35	30-31	26-28
Low Average	37-41	35-39	31-34	29-31	26-29	22-25
Poor	30-36	30-34	26-30	25-28	22-25	20-21
Very Poor	< 30	< 30	< 26	< 25	< 22	< 20
FEMALE	**AGE: 18-25**	**26-35**	**36-45**	**46-55**	**56-65**	**65+**
Excellent	> 56	> 52	> 45	> 40	> 37	> 32
Good	47-56	45-52	38-45	34-40	32-37	28-32
High Average	42-46	39-44	34-37	31-33	28-31	25-27
Average	38-41	35-38	31-33	28-30	25-27	22-24
Low Average	33-37	31-34	27-30	25-27	22-24	19-21
Poor	28-32	26-30	22-26	20-24	18-21	17-18
Very Poor	< 28	< 26	< 22	< 20	< 18	< 17

Normative VO2 max values - competitive cycling population	MALE	FEMALE
UK Cat 3 racer	<50	<40
UK Cat 2 racer	50<63	40<50
UK Cat 1 racer	58<73	45<55
Domestic pro	68<80	50<60
WorldTour pro	75<90	60<

biggest limiting factors when monitoring performance indoors is the rider's temperature regulation. The testing lab should be cool.

The rig you ride should be fully adjustable so you can replicate your own position perfectly — take with you your critical measurements, including reach, seatpost height and drop to the bars if you're not using your own bike. You'll be asked to wear a mask to monitor your breathing, which feels odd and restrictive, but as Stevenson demonstrated by asking me to inhale and exhale as hard as I could, it does not impede breathing at all. The better masks have super-comfortable, soft gel seals and are securely fastened with a netting harness that sits behind your head.

The first reading I got was reassuring. My breath exhaled through the mask and into a chamber where it was analysed and showed I have low oxygen consumption at rest, when not pedalling at all. "That suggests you're aerobically conditioned," says Stevenson.

After a good 10-minute warm-up with some easy pedalling, the test starts. Stevenson had explained exactly what was going to happen, which is good practice. It means you can be prepared psychologically for the effort you're going to need to make and know where it's going to kick in and what you should be doing.

You need to keep a cadence in the range of 80-90rpm and every minute the resistance is increased by 30W. The early stages are fine and the resistance increase as you go through 180-230W is barely noticeable. Then it starts to get tougher.

UPPING THE ANTE

The increases are ramps, rather than steps, so the load does rather creep up on you. It's like a long hill that just gradually gets steeper and steeper. Beyond around 300W, it's hurting. The cadence becomes harder to maintain and breathing quickens. But, so far, it's no tougher than a fast chaingang.

But each new 10-second chunk brings fresh hell — I can tell it's getting towards the end game as Stevenson starts shouting encouragement. Now the mask feels as though it's getting in the way of breathing. It's not — but breathing is a fight. The legs still feel strong but the lungs are burning. Maintaining cadence takes every ounce of focus and concentration you can muster.

The last minute is pretty much unmitigated agony. It's not like sprinting for a line because, when you do that, you can see the line and you know where the agony stops. Here, you just have to push on until what the physiologists term 'failure' — and that's not a line in the road. To some extent, it's a line in your head, but it's invisible and then, bang, you've hit it.

I stop, collapse on the bars, lift the mask and heave enormous breaths of profound relief that the pain has stopped.

HAVE YOU GOT WHAT IT TAKES TO BE A PRO RIDER?

Julian Varley, an 18-year-old racer, has some enviable numbers. "I want to be a pro bike rider and I'd like to race for a WorldTour team," says Varley, who's spent the summer in Belgium to cut his teeth racing abroad, thanks to funding from the Dave Rayner Fund.

So, has he got what it takes? His numbers, and especially his VO2 max, suggest that he might. Varley weighs around 63kg, ideal for a racer. He trains for around 15 hours a week, and he has at least one first place on his palmarès. He won a senior race, aged just 17, in the North Yorkshire Evening Road Race League.

Clearly Varley has a long way to go; he'll need to learn race craft and all the other myriad factors that combine to make a great bike racer, but is the raw physiological material there?

According to Stevenson, yes, it is. "His VO2 max is 81ml/kg/min and on the ramp test he reached 440W. With his weight at around 63kg, that's a power to weight figure of 7W/kg. These are the sorts of numbers [produced by] a WorldTour rider.

"Through improvements in economy and oxygen utilisation, this suggests he has the potential to get very close to the 500W mark or higher, resulting in a maximal power-to-weight-ratio close to 8W/kg for a 2-3min effort.

"Obviously, though having a great VO2 max and maximal aerobic power output is good, that alone won't win you a race. Making it to the end of the race in a reasonable shape to use this ability is arguably more important."

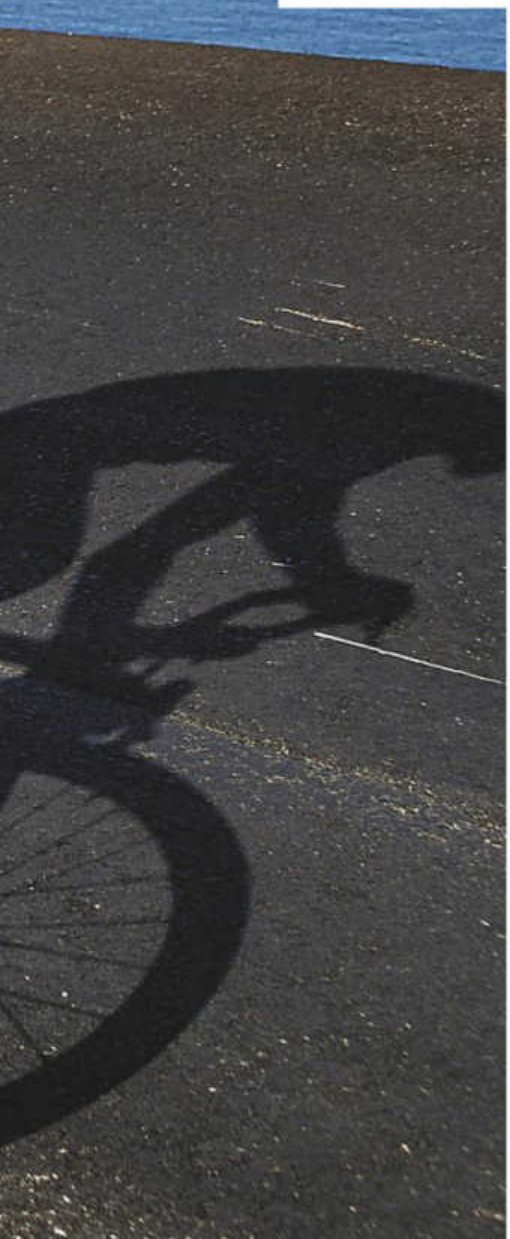
The results give Varley a focus for his training. Stevenson's analysis of the data shows that perhaps the easiest gains, the way to really develop Varley's huge potential, are to concentrate on increasing his power numbers at lactate threshold.

At the moment, this figure is relatively low, at 270W — the power that Varley churns out as the lactate starts to flood his muscles. Stevenson believes that this could be increased to 330-350W, given the right training. And that could make the difference when it comes to being in the right position to make a race-winning move.

Few of us can boast numbers as impressive as Varley's, but his case proves that testing and the data it generates can be a shortcut to making big gains — by revealing where the most room for improvement is found.

STRIKING A BALANCE

There's a fine line between training optimally hard and training too hard. *Dan Henchy* examines the difference between physical self-realisation and self-sabotage



Too little training and you'll never reach your full potential; too much and you'll not only fall short but also risk affecting your mood and health. What muddies the waters further is that it's impossible to view training in isolation; the rest of your life will determine the optimum ratio of training to recovery. Striking the right balance is like trying to hit a moving target.

It's quite common to view this as a problem unique to full-time professional athletes who push their bodies to the absolute limit to become the very best. Thus, elite athletes are at high risk of overdoing it, but it's not unheard of for amateur athletes to fall foul of the same problem. We have previously discussed the issue of training stress and general life stress being inseparable. It's wrong to assume that one doesn't affect the other. For amateur and pro athletes alike, it's more useful to think in terms of total stress. Work, kids, relationships, training, they all use up energy, and if you have extra commitments in one area, it can tip the balance in others.

The human body is highly adaptive, provided the right training stress is applied at the right time and sufficient recovery allowed. What tools can we use to get this balance right?

RULE OF THUMB

If you've read books on training, you'll have come across rules of thumb, or heuristics, to help prevent overtraining, such as:

- "Never increase your long ride by more than 10 per cent each week"
- "Plan your training to include a rest week every third or fourth week"
- "Alternate hard days with easy days"

There are many others, and all are grounded in the experience of those who have been there and done it. The particulars of these phrases don't much matter, but each one captures a key piece of advice that will prevent you overdoing it in training. For example, some criticise the first heuristic above by stating that if you increased your long ride by 10 per cent every week, it would only take 15 weeks to see your long ride quadruple. If you're already riding 60 miles each Sunday, this advice is evidently not very helpful. However, the concept remains a sound one; the aim of this rule of thumb is to prevent riders ramping up their training too quickly. Increases of more than 10 per cent per week are not sustainable in the long run.

Heuristics offer a lot of good advice for the cyclist looking to strike a healthy balance between training load and recovery. However, if we are looking to optimise this balance, we need to look at other methods. Maximising performance is an individual process. While general principles might help us get 90 per cent of the way, the last 10 per cent comes from fine-tuning. For this, we need to get a little more analytical.

DATA MODELLING

If you have an analytical mind, you'll be pleased to know there has been a lot of research into modelling the response to training. One of the best known is Banister's impulse-response model. This has been popularised with web-based software company TrainingPeaks, which uses the model as the basis for its performance manager chart.

The basic premise is quite straightforward. Peak performance requires the building of form. Form is equal to fitness minus any fatigue that you are

Photos: Jesse Wild, Chris Catchpole

holding. You can be very fit but if you're fatigued, your form will suffer. When you complete a training session or a block of training, you increase your fitness but also fatigue. When fatigue is high immediately following a hard training session, your form is low.

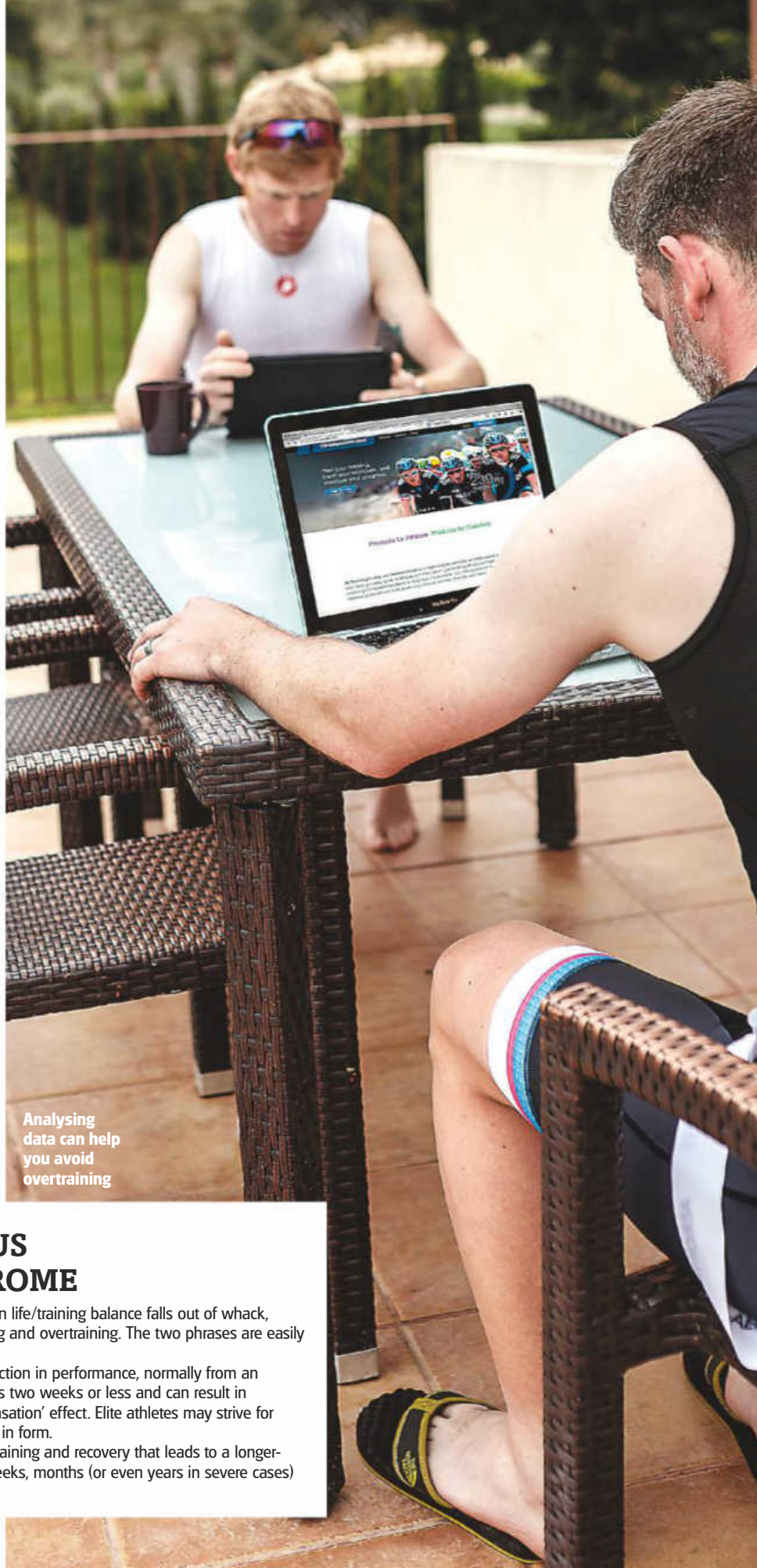
The key is that fatigue disappears much faster than fitness. After a few days' rest, fatigue has reduced, fitness has grown, and your form begins to show. For a single training session, this idea is simple to follow intuitively — but training involves stringing together multiple training sessions. The impulse-response model attempts to predict what happens when you do so. If this idea appeals to you, *Training and Racing with a Power Meter* by Dr Andrew Coggan and Hunter Allen is a great place to start. Alternatively, find a coach familiar with this type of analysis.

The limitation of this kind of modelling is that it doesn't account for the non-training-related stress. While the model may suggest from your training that you are due a peak performance, if you're having a very stressful period at work and not sleeping properly, you're unlikely to ride at your best. Equally, this approach does require a little effort and diligence to make meaningful use of the model. Training load must be quantified (either using a power meter, heart rate monitor or subjective rating) with regularity and accuracy. 'Garbage in, garbage out' is a phrase borrowed from computer science to explain that the modelling approach is only as good as the quality of the data you feed into it.

Mathematical modelling is a very powerful tool for optimising the balance between training and recovery — until something happens that throws the model off. A good model can help plan the ideal progression in training load, but you need a system of monitoring that allows adjustments on the fly.

DAILY MONITORING

Despite all the time, effort and other resources that have been devoted to understanding training response and the best way to avoid overdoing things, in many cases the best monitoring tool



Analysing data can help you avoid overtraining

OVERREACHING VERSUS OVERTRAINING SYNDROME

If you delve into the research on what happens when life/training balance falls out of whack, you'll probably come across the phrases overreaching and overtraining. The two phrases are easily confused, but here are the main differences:

Overreaching is an increase in fatigue and a reduction in performance, normally from an intensified period of training. Recovery normally takes two weeks or less and can result in subsequent increase in form due to a 'super-compensation' effect. Elite athletes may strive for overreaching at specific times in search of this boost in form.

Overtraining is a long-term imbalance between training and recovery that leads to a longer-term drop in performance. Recovery takes several weeks, months (or even years in severe cases) with no subsequent increase in form.

available is basic self-reporting. It's a question often avoided in the tech-driven world: "How do you feel?"

Keeping track of some simple, subjective measures is among the most powerful habits for monitoring your training response. Changes in mood, energy levels, soreness and fatigue are the most obvious markers of whether you are coping with the prescribed training load. Take a minute or two each morning to score these on a scale of one to 10. Going to the effort of recording this data will make you much more aware of how well recovered you are. Act on this information. At a basic level, if you note that you are feeling tired, with a tendency to snap at loved ones, it's a sign that you probably need to back off the training a little — or at least prioritise some extra recovery. Maybe an extra hour or two in bed will be enough for you to bounce back.

Equally powerful, if you track subjective metrics over time, you may begin to identify patterns that inform changes in your training routine. For example, perhaps the first week of each month is particularly stressful at work with reports due from the preceding month. It may make sense to schedule recovery weeks for this stressful time. Or maybe your kids' after-school clubs are on Tuesdays and you spend the evening rushing around, leaving you knackered on Wednesday. It doesn't make sense to schedule a key workout when you're not at your best. Use daily monitoring to optimise the weekly structure of your training and to fine-tune training load.

WAKING HEART RATE

If you're in search of a more objective metric to monitor your daily recovery, waking heart rate (HR) has stood the test of time. A low resting heart rate is a marker of good aerobic fitness, but for daily monitoring the most crucial aspect to establish is your own individual baseline. A few key steps should be taken to make effective use of this metric:

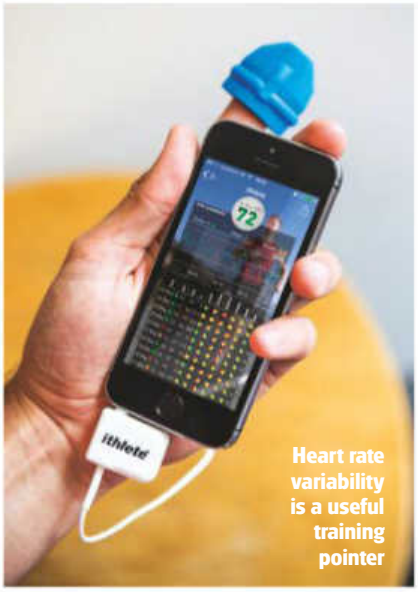
Measure your HR first thing in the morning on waking each day while lying down in bed. Take a waking HR recording every day for at least a fortnight before making any judgements. The absolute number doesn't matter; establish your normal range during light training.

If your HR differs significantly from your normal range, schedule an easy day of training. A second day with an abnormal waking HR should see complete rest until it returns to within the normal range.

These guidelines aren't set in stone but give a flavour of how the data can be used. The more data you collect, the more in tune you will be with the normal range and the easier it will be to identify abnormal readings.

HEART RATE VARIABILITY

Recent research has suggested heart



Heart rate variability is a useful training pointer

rate variability (HRV) is a powerful tool to understand and optimise the balance between training and recovery. HRV is a measure of the differences in time between consecutive heartbeats. For example, if you have an HR of 60bpm, there is on average one second between each beat. In reality, this time difference might vary between 0.8-1.2 seconds, or even more. The more variation in this difference, the greater the HRV. At a basic level, higher HRV indicates freshness and an increased capacity to accrue fitness from training. The monitoring protocol for HRV is similar to that for resting HR, except you'll need a specialist app and the data is little more complex. More information about HRV is available online.

With all of these daily monitoring tools, consistency and standardised measuring are key. Individual measurements are practically meaningless but after a period of weeks and months you can begin to identify normal ranges, allowing you to flag up times when you need a little more recovery or a little less training.

THE PERFECT BALANCE

So, what is the best way to balance training and recovery? In truth, there is no silver bullet. Rules of thumb and the experience of others — learning from the mistakes of previous generations of riders — are the starting points. Mathematical modelling can help to design a theoretically optimal training progression with the aim of completing the hardest training at the right time. The rigorous implementation of basic daily monitoring can help make sure that the realities of daily life keep you close to the plan but with enough flexibility to make minor adjustments on the fly. There is no one-size-fits-all approach, but striking a balance between training and recovery is the most crucial aspect of any training plan, so it's worth spending time getting that crucial balance just right.

YOU SHOULD GET OUT MORE!

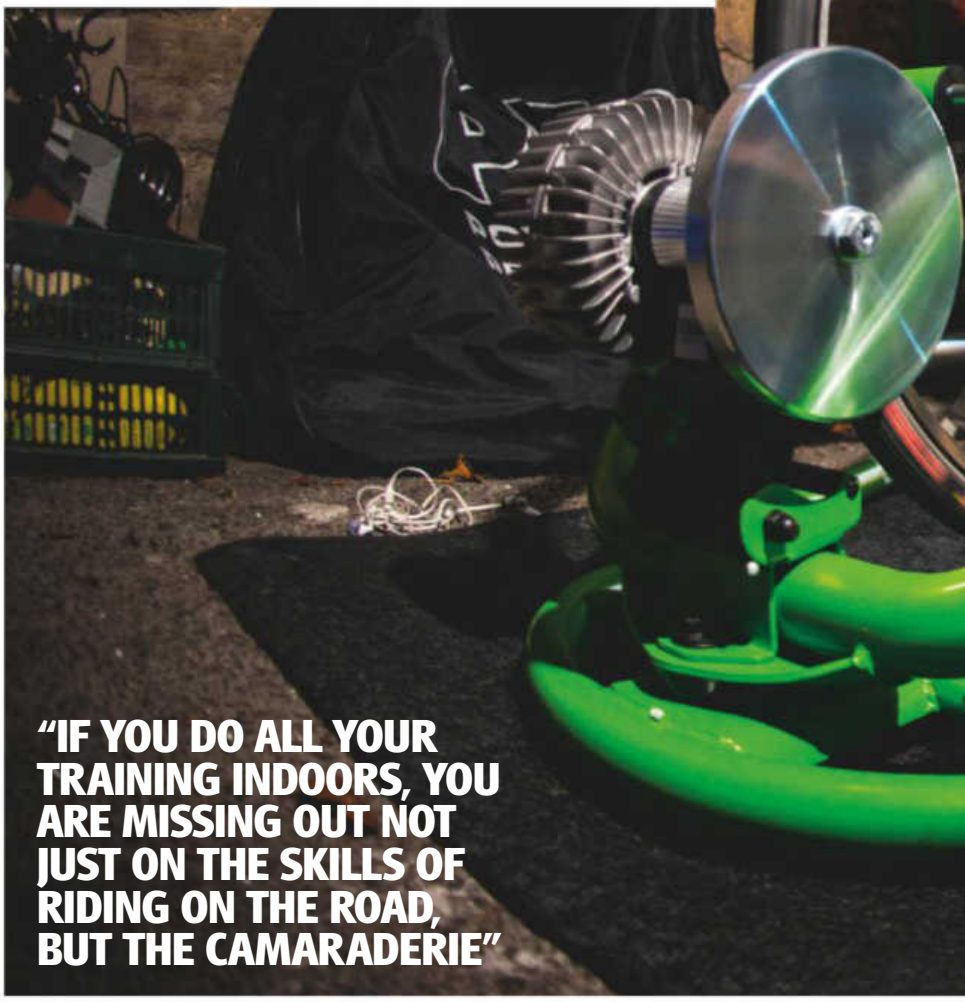
Turbo sessions are great, but is your love of hi-tech, high-intensity indoor training slashing your time in the great outdoors and limiting your skills? *John Walsh* finds out

Zwift, Sufferfest, Trainer Road, Wattbike, the list goes on; there are plenty of ways of spicing up what used to be a boring and tedious turbo session. If you're time-poor or the weather is inclement, training indoors is often the best option. Indoor training sessions can be carefully structured, mentally as well as physically stimulating, and hard enough to put your eyes out on stalks.

But regardless of these advantages, we are seeing a worrying new trend: riders spending more time on their trainers than outside on their bikes.

The 'pain cave' is the latest cycling accessory, an entire room dedicated to indoor training. Kitted out with the latest audio and visual equipment, it has a fan, turbo and a mat to absorb the litres of sweat its owner goes there to produce. It's as though the world of Zwift or Sufferlandria is now more appealing than life outside on two wheels.

If you live in a busy urban centre, training inside feels safer, the environment more controllable. You may train more effectively if you aren't slowing or stopping in traffic. However, if you do all your training indoors, you are missing out — not just on the skills of riding on the road, but the camaraderie and the benefits of being in an outdoor space. Here are our top five reasons why you should keep cycling in the real world.



"IF YOU DO ALL YOUR TRAINING INDOORS, YOU ARE MISSING OUT NOT JUST ON THE SKILLS OF RIDING ON THE ROAD, BUT THE CAMARADERIE"

BIKE HANDLING SKILLS

Pirelli Tyres once used the line "Power is nothing without control", and the same can be said of bike riding. It's great that your hours on the turbo have raised your power at threshold by 20w, but if when it comes to an event you are slow while descending and cornering, you won't do justice to the hard training you've done.

Riding fast outside feels really good, and the fitter you are, the harder you can attack hills; the faster you approach corners and the more skilful and confident you need to be in the bunch. If your goals involve events or races, then acquiring outdoor riding skills needs to be a priority.

NUTRITION

Eating and drinking during long events is absolutely key to finishing successfully. Even if you are really fit, without proper fuelling you will lose time and the ride will feel harder. If you are mainly doing hour-long indoor turbo sessions, you won't be needing to eat, take gels or even slurp an energy drink. Long outdoor endurance rides give you a chance to experiment with your nutrition strategy, discover which foods suit you and agree with your stomach. It also gives you a chance to practise the simple skills of getting your bottle in and out of its cage, undoing wrappers, replacing litter in your

Nothing beats the great outdoors

Indoor training can be ideal when the weather is bad or if you're looking to improve your power output, but when it comes to cycling. nothing beats the feel of fresh air on your face when you're out on the road. You improve your riding skills, it's social and most of all, it makes you feel good.

back pocket. This sounds incredibly basic but we have recently seen examples of riders who have under-fuelled or become dehydrated simply because they have not had the skill or confidence to eat and drink while riding.

MIND NOT JUST BODY

There's no disputing the endorphin rush you can get from a super-tough turbo session. To have absolutely hammered yourself to the point where your knees are shaking and hands are trembling feels good. But some of the mental benefits from exercising outside you just can't get when training indoors.

Being in a green space such as a park, woodland or rural area lowers stress levels. In a study published in the journal of Environmental Science and Technology, in 2011, researchers studied 523 subjects who completed the same exercise inside and outside, reporting how they felt immediately afterwards. The researchers concluded that when "compared with exercising indoors, exercising in natural environments was associated with greater feelings of revitalisation and positive engagement, decreases in tension, confusion, anger, and depression, and increased energy."

IMMUNE BOOSTING

You might think that locking yourself away in your 'pain cave' means you are less likely to get ill. Exercise suppresses the immune system, so it is at its weakest immediately after a hard session — when avoiding contact with other germ-carrying humans may help keep you cold-free. Surprisingly, though, exercising outside might help to boost your immune system, as exposure to plants and trees has been shown to have a strengthening effect.

In a study published in the Internal Journal of Immunopathology and Pharmacology in 2007, people who took two-hour walks in a forest had a 50 per cent increase in the levels of their natural killer cells — which circulate through the body killing bacteria, viruses, fungus and other invaders.

SCREEN BREAK

We all spend far too much time in front of screens: the computer at work, the TV at home, watching drama box sets on the sofa, and phones as we endlessly scroll through Twitter and Instagram. If your luxury 'pain cave' is complete with a large computer or TV screen to help better appreciate the graphics of Zwift or the race footage of Sufferlandria, it may be worth considering a screen break.

Staring for too long at a screen won't turn your eyes square, whatever your mum told you, but the constant exposure to the blue light can damage our eyes and our health. Blue light is harmful because it's the highest-energy wavelength of visible light. It is able to penetrate all the way to the back of the eye, through the eyes' natural filters and can lead to eye diseases like macular degeneration.

When watching screens, protecting the eyes with glasses or lenses that stop the blue light from penetrating the eyes is one approach. Spending less time staring at a screen and getting outside is another. If because of time pressures you often find yourself training late at night, be aware that studies show that exposure to blue light a couple of hours before bedtime suppresses the substance melatonin and delays deep, REM sleep.

Photo: Andrew McCandlish

Beetroot dishes

As well as injecting colour onto your plate, the nitrates in beetroot can help make muscles more efficient during exercise

BEETROOT & BUTTERNUT SQUASH SOUP WITH CHEDDAR CHEESE SOLDIERS

● **Serves: 4** ● **Preparation time: 5 minutes** ● **Cooking time: 30 minutes**

Each serving contains

SALT	SUGAR	FAT	SAT FAT
1g	9g	11g	5g
18%	10%	17%	27%

% GDA (guideline daily amount)

2 tsp oil
1 small onion, diced
2 sticks of celery, diced
1 clove garlic, finely diced
1 tsp nutmeg
1 tsp cinnamon
800g pumpkin or butternut squash, peeled and chopped small
800ml vegetable stock
4 traditional beetroot (cooked beetroot dipped in vinegar), roughly chopped
4 slices of bread
4 slices cheddar cheese

1 In a large saucepan heat the oil over a low to medium heat and cook the onion, celery and garlic with the lid on, stirring occasionally, for 8-10 minutes until they are soft.

2 Sprinkle in the nutmeg and cinnamon then add the butternut squash and vegetable stock. Bring to the boil and simmer for 15 minutes, add the beetroot and continue to cook for another five minutes until everything is soft.

3 Allow the soup to cool a little then blend until smooth, add some extra stock if it's too thick. Season well and reheat when ready to serve.

4 Toast the bread, butter if desired, then under a hot grill melt the cheese on top until bubbling and browning at the edges. Cut the toast into soldiers and serve with the hot soup.

HONEY & GINGER INFUSED BEETROOT, CHICKPEA & BABY KALE SALAD WITH PORK CHOPS

● **Serves: 2** ● **Preparation time: 5 minutes** ● **Cooking time: 25 minutes**

2 tbsp honey
2 tbsp wholegrain mustard
2 tbsp olive oil
2 tsp balsamic vinegar
3-4 sprigs of thyme, leaves picked
2 pork chops
400g tin chickpeas
4 spring onions, sliced
1 carrot, grated
4 honey & ginger infused beetroot, cut into wedges
2 handfuls of baby kale leaves

1 Make the dressing by mixing together the honey, wholegrain mustard, olive oil, vinegar and thyme leaves and season well. Pour half over the pork chops and reserve the rest for the salad. Heat the grill to medium-high.

2 Once the grill is hot put the chops under the grill and cook for 8-10 minutes on each side (depending on the thickness), basting with any remaining dressing when you turn them. Cook until, crispy and charred on the outside but just cooked in the middle.

3 When the chops are almost done put the chickpeas and their liquid in a saucepan and warm over a medium heat for 3-4 minutes.

4 Drain the chickpeas and tip into a bowl. Pour over the reserved dressing and stir through. Add the onions and carrots and combine well, then add the beetroot and give one last stir.

5 Put a handful of baby kale onto each plate, spoon on the beetroot mixture, drizzling the dressing over the kale as you go. Serve with the pork chops.

Each serving contains

SALT	SUGAR	FAT	SAT FAT
0.5g	27g	15g	1g
7%	30%	24%	3%

% GDA (guideline daily amount)

567 calories

Enjoy on its own as a light lunch, or serve with pork chops fresh off the BBQ for a simple summer supper

CUMIN & POMEGRANATE INFUSED BEETROOT, HALLOUMI & COURGETTE KEBABS IN LIME & TOASTED CUMIN SEED DRESSING

Serves: 2 Preparation time: 10 minutes Cooking time: 10 minutes

1 tsp cumin seeds
½ lime, juiced
1tbsp olive oil
200g halloumi, torn into bite sized chunks
4 cumin & pomegranate infused beetroot, cut into quarters
4 spring onions, cut into 3cm pieces
1 small courgette, sliced into discs
4 kebab sticks

1 If using wooden kebab sticks, soak them in water before using so they don't burn on the barbecue.

2 In a small frying pan, toast the cumin seeds for a minute or two until they become fragrant, taking care not to burn them. Remove from heat, stir in the lime juice and oil and season well.

3 Tip the veg and halloumi into a large bowl, pour over the dressing and combine well to coat. Thread the veg and cheese onto kebab sticks, reserving any dressing left in the bowl. Cook for 4-5 minutes on each side on the BBQ or under the grill, until the cheese is browned and crisp on the outside and the veg is cooked.

4 Pour the reserved dressing onto a serving plate. Once cooked turn the kebabs on the serving plate to soak up the remaining dressing.

Each serving contains

SALT	SUGAR	FAT	SAT FAT
6g	16g	33g	17g
100%	17%	47%	8.7%

% GDA (guideline daily amount)

Beetroot has loads of benefits for cyclists but the high salt content in this recipe means it is best reserved for after long, hot rides when you may have experienced sodium loss

697 calories

BEETROOT STAINED BOILED EGGS & PARMA HAM SALAD

Serves: 4 Preparation time: 10 minutes plus chilling (at least one hour) Cooking time: 10 minutes

Each serving contains

SALT	SUGAR	FAT	SAT FAT
1g	11g	8g	2g
18%	12%	12%	12%

% GDA (guideline daily amount)

For the salad:
4 eggs
6 traditional cooked beetroot (cooked beetroot dipped in vinegar) or juniper berry & black pepper infused beetroot, sliced
1 tsp olive oil
1 thick slice of bread, crusts cut off and ripped into small chunks
4 slices Parma ham, torn
1 bag baby leaf salad

For the dressing:
2tbsp olive oil
2tsp red wine vinegar
small bunch chopped parsley

1 Put the eggs in a pan of water, bring to the boil and cook for six minutes. Drain and run under cold water to cool, then remove the shell.

2 Slice the beetroot and put a layer into a bowl small enough to hold the eggs snugly. Put the eggs on top then tuck more beetroot all around the eggs and add another layer over the top. Cover with cling film and chill for at least an hour, but preferably overnight.

3 When the eggs are done, heat the oil in a frying pan and add the bread, toss a few times to coat in oil and season. Cook for 3-4 minutes until crisp and crunchy.

4 Make the dressing by combining the oil, vinegar and parsley and seasoning.

5 Set the eggs aside and toss the beetroot (reserved from staining the eggs), leaves and croutons in a bowl with the dressing then tip onto a plate. Halve the eggs and lay them on top with the torn ham.

178 calories

These delicate pink eggs partner wonderfully with the earthy traditional beetroot, crunchy croutons, savoury Parma ham and fresh leaves

EAT, DRINK & RIDE FASTER

Rob Hicks talks to Glenn Kearney, head nutritionist at Etixx-Quick Step, to discuss the importance of fuelling and hydration for all cyclists

Glenn Kearney was the nutritionist for the New Zealand All Blacks rugby team before becoming the lead nutritionist at UK Athletics. Now, he is the head nutritionist for Mark Cavendish's team, Etixx-Quick Step.

While it's all well and good heeding the advice given by professional cyclists — after all, they are the ones out there riding their bikes — it's never a bad idea to listen to the ones who went to university to learn about the role food and drink has on the body.

Cycling is a tough sport. There's no easy way around it apart from hard training, commitment and dedication. But many, if not the majority, of cyclists are their own worst enemies because they fail to take their nutrition seriously.

While the food you eat won't turn you into a faster and fitter cyclist overnight, it can help feed your muscles for the onslaught of heavy training; prolong the time to fatigue; help strengthen your immune system (which exercise can temporarily weaken); and it can help rebuild muscle damage, enabling you to recover quicker and get back on the bike much sooner.

Cycling *is* a tough sport. But fuelling your body well makes it easier and more enjoyable. So where do we start?

"Your nutrition is very tightly linked to your performance and enjoyment on the bike," says Kearney. "The impact of nutrition can be acute. What and when you eat in the hours preceding and during your ride will have a significant effect on your ability to sustain a hard ride beyond 60 minutes. When it's hot, the effect of hydration becomes even more paramount.

"Failure to have and implement a drinking strategy can be costly even in training sessions, let alone a race scenario. It is often the acute effects of nutrition that tend to resonate with riders, which is understandable, as we feel those effects on the bike — it's easy to appreciate the connection and the difference good strategies can make.

"However, the wider role of nutrition in supporting the immune system, accelerating recovery, rebuilding and adapting 'stressed' tissues as a consequence of training, and maintaining key micronutrients stores, is often the untold story, and ultimately when done correctly will turn you into a robust rider."

TAKE TIME TO GET IT RIGHT

So let's break it down. During heavy bouts of training, what would happen if you were to ignore your nutrition?

"To put it simply, you won't get the maximum benefit from your training. In fact, in the short term you put yourself in a position where you may not be able to complete the training session at the intensity required — therefore providing a poor stimulus for the body to adapt to," Kearney says. "Intense periods of training require both adequate fuelling and recovery to ensure you can approach each session with full commitment.

"IF YOU'RE NOT REPLACING MICRO NUTRIENTS SUCH AS VITAMIN C AND IRON, YOU'RE TAKING A RISK"

"If you're not consistently giving your body the right micronutrients such as vitamin C, magnesium and iron, you will be placing yourself at increased risk of failing to cope with the training demands. This places even more stress on your immune system, which is already under significant pressure.

"Nutrition really is a personal thing, which means it takes an investment of time to get it right — and it starts with understanding your general diet and areas of deficiency, as well as experimenting in training to help discover what fuels you best. I meet cyclists who train almost as hard as professional riders, but only really think about nutrition when it comes to race day or long rides. This invariably takes the form of just focusing on carbohydrates for fuelling."

Kearney is right. The morning or night before an event, how many of you focus primarily on how many gels or energy bars you have, disregarding the important of your pre- or post-ride meal? More often than not, it's an afterthought, and you end up having to make do with what you can find in the fridge or cupboards.

Again, cyclists, and a lot of athletes for that matter, tend to focus on macronutrients such as bread, fish, dairy products and meat — foods that give you energy. During heavy training bouts, this is of course very important, but as Kearney points out, micronutrients such as vitamins and minerals are just as vital, helping restore and maintain health.

So what can cyclists do to avoid nutritional pitfalls? "Athletes at all levels need to be aware of their dietary habits and listen to their body — unfortunately it's not a case of finding a plan and just following it blindly," says Kearney.

"That said, the best thing you can do is to keep a food diary, something that's made much simpler these days,

Photos: Tim De Waele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ISOTONIC
ENERGY GEL
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janom

thanks to the mobile apps available. Our nutritional habits tend to be fairly consistent over a two- to three-week period, and monitoring yours will give you a good idea of whether you have the right balance of macronutrients such as your carbohydrates, fats and proteins, and micronutrients such as vitamins and minerals. This allows you to make adaptations and then monitor the effects on recovery, performance on the bike and general feelings of wellbeing. For a small amount of time, it's such a worthy investment."

"I'M ALWAYS AMAZED AT HOW RIDERS OBSESS OVER POWER DATA YET NEGLECT THEIR NUTRITION"

MORE THAN JUST CARB-LOADING

Is it possible to get through a race or sportive without the right nutrition? It's a question that is often asked. In an ideal world, cyclists should get it right, but life's never that straightforward.

"It's possible to get through an event without taking on additional supplementation," explains Kearney. "But unless you've made specific training adaptations — for example, using fat as fuel — you're highly unlikely to have a positive experience, and I really wouldn't recommend it. Add in external variables such as heat and humidity, physical factors such as increased effort and mental factors such as additional stress and concentrations and nutrition becomes a vital piece of your race day kit."

Do the professionals ever get their nutrition wrong? "Of course! While it's true that professional cyclists are very well supported and closely follow bespoke nutrition plans, in the high-stress environment small details — such as not taking a sip from a water bottle or focusing too wholeheartedly on the effort of the race, such as in a breakaway, and not taking a gel — can be overlooked. The most common mistake amateurs make is focusing only on fuelling when thinking about nutrition. Adequate energy provision is vital, but recovery, hydration and general diet are equally as important. It's not all about carbohydrates! That's what you must remember."

All sound advice, but can it be made simpler? "Yes, totally," says Kearney. "I have three golden nutrition rules:

1. Get the fundamentals right first. "Look at your diet. Are you getting enough energy and the right amount of macronutrients, such as carbohydrates, fats and proteins, for you as an individual and your training demands? Remember, it is not one-size-fits-all. Micronutrients will optimise your performance; never forget about them. As I mentioned earlier, keeping a food diary is a great start to monitor your daily intake. These are incredibly revealing and when done honestly can provide some clear insights into reasons for good and not-so-good performances on the bike. I'm always amazed at how riders obsess over power meter data yet at times don't have a clear

FITNESS APP TO ASSIST NUTRITION

The latest way to keep a food diary — on your smartphone

MyFitnessPal is available online or as an app. It is incredibly simple to use and gives you a breakdown of your diet which a few years ago would only have been available from a highly qualified nutritionist. The unreliable factor is remembering to record, honestly, all you have eaten.

Hook MyFitnessPal up to your Garmin device and the accuracy goes up a notch. It will sync to garmin.connect so that all the calories you expend during training get added to your account, and as the day goes on you can see exactly how much you should be eating to meet your needs. You can set goals based on weight loss and how much of each macronutrient you aim to eat each day.

However, it is not simply about calories. MyFitnessPal also generates easy-to-understand data showing you the macronutrients: the percentage of your diet coming from fat, protein and carbohydrate. It also delves deeper into the micronutrients you should be eating each day and telling you the exact amount of each nutrient you have consumed, and whether it's enough.

There is a huge amount of information at your fingertips, but it does need interpreting. Knowing at the end of the day that you haven't eaten much vitamin C, zinc or iron is only useful if you know which foods contain those things.

However, over time, keeping track of your eating helps you identify the good and bad trends in your diet. Indeed, filling in your daily food helps raise awareness of how much and when you are eating. Research has shown that people who keep food diaries tend to eat more healthily and hit their weight goals more easily.

Keeping on top of fluid requirements is essential for peak performance

NUTRITION ADVICE FROM ETIXX'S EXPERT

Glenn Kearney gives his top nutrition tips:

Nutrition is adjustable
Adjust your pre-ride fuelling to suit the ride. If it's a low-intensity session, carbohydrate loading may lead to weight gain, as your body is primarily using fat as a fuel source. Interval training, on the other hand, will draw much more heavily on glycogen stores and therefore it may be highly appropriate to add some additional carbohydrates such as an energy loading pre-ride.

Recovery needs protein and carbohydrates
Carbohydrates and protein are important in recovery. Carbohydrates will help replace depleted glycogen stores and the muscles will be more responsive and recover more quickly if these are taken on board within 30 minutes of finishing a ride. Protein is important to assist the repair of micro-tears in the muscle and general adaptation to the 'stress' of the training session — slowly making you stronger for future rides on the bike.

Know your losses
Know your personal fluid loss. I recommend 5-7ml of fluid per kilo of body weight before starting exercise to top up your fluid levels.

picture on the basics of nutrition, e.g. hydration, energy intake, carb quantity and quality."

2. Have a recovery plan. "This both maximises the training benefit and prepares you for the next season. Inadequate recovery can lead to diminishing returns from training and, ultimately, fatigue, illness and injury. I recommend a recovery shake after every session, which helps replace lost muscle glycogen to fuel your next session, and includes quality protein."

3. Experiment in training — not in an event. "Never in an event. This is an obvious one, but a golden rule which I see broken time and time again."

PORTION SCIENCE

There's no doubt that certain foods can help you perform better. But exactly how much of them do you need to eat to benefit? *Laura Tilt* shows you how to spend your calories wisely with our guide to proven portion size

Salmon

Proven portion
1 large fillet/150g
Why eat it To fight inflammation

Nutrition
Kcal: 236
Carbs: 0g
Protein: 25g
Fat: 15g

Omega-3 fats from oily fish are known to dial down inflammation by inhibiting pro-inflammatory hormones. Researchers at Harokopio University in Athens found adults eating more than 300g of fish a week (two-three portions) had on average 33 per cent lower levels of inflammatory markers. But it's not just long-term benefits to be gained — in a recent study from Azad University, male volunteers who took a daily supplement of three grams of omega-3 while taking part in an eight-week resistance training programme had less inflammation and cellular damage than those in a control group. Get the benefits with a serving of salmon — one large fillet contains around three grams.

Chocolate milk

Proven portion
475ml
Why drink it To supercharge post-ride recovery

Nutrition
Kcal: 330
Carbs: 52g
Protein: 18g
Fat: 5g

Seen in the hands of some of the world's elite athletes, a bottle of chocolate milk is the ideal recovery aid, boasting the ideal 3:1 ratio of carbs to protein recommended for recovery, plus more sodium than an equivalent volume of sports drink. Research comparing chocolate milk to a standard sports drink suggests the sugars are better absorbed, plus the protein in milk is a mix of both fast and slow-release proteins, which means amino acids are drip-fed to the recovering muscle over a prolonged period. In one 2010 study from the University of Texas, trained cyclists given chocolate milk immediately after cycling for 1.5 hours at 70 per cent of VO2 max went on to perform better in a subsequent 40km time trial than those given a carbohydrate-only drink containing the same number of calories.

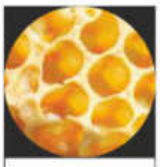
Cherry juice

Proven portion
30ml concentrated juice
Why drink it To maintain muscle strength

Nutrition
Kcal: 236
Carbs: 0g
Protein: 25g
Fat: 15g

Antioxidants in tart cherries act as warriors against the oxidative damage and inflammation that comes as a result of hard exercise, which translates to faster recovery for your muscles. In one study from the Human Performance Laboratory at the University of Vermont, college students drinking 330ml of tart cherry juice twice daily, during a period of eccentric exercise training, experienced less pain and maintained around 20 per cent more muscle strength than those drinking a placebo. Sadly the same effects can't be achieved by popping sweet cherries, so get the recommended dose from 30ml of the concentrate juice — almost 3,000 tart cherries go into each bottle. Shoot the liquid into a yoghurt or post-ride smoothie for an easy way to maximise recovery.

Photos: Roger Stowell, Paul Quagliana, Chris Alack, Michael Paul, Gus Filgate, Bill Kingston, Simon Pask, www.timeincukcontent.com



Honey

Proven portion
2 tbsp per hour
Why eat it To fuel long rides

Nutrition
Kcal: 128
Carbs: 35g
Protein: 0.2g
Fat: 0g

If you're looking to use more real food to fuel your rides, honey could be just the ticket. The carbohydrate-rich nectar is a mixture of two sugars — glucose and fructose. In recent years, the use of multiple sugars has been found to boost carbohydrate oxidation, making honey a good alternative to gels. Researchers from the University of Memphis found the combination honey and water was as effective as dextrose gels for boosting performance in a group of cyclists performing 40km time trials. A tablespoon of honey contains around 65 calories and 17 grams of carbohydrate — which means 2-3 tablespoons per hour will tick the 30-60 grams needed to help you push through fatigue.

Turmeric

Proven portion 200mg (1.5 tbsp)
Why eat it To dial down muscle soreness

Nutrition
Kcal: 44
Carbs: 9g
Protein: 1g
Fat: 0g

Turmeric might be found in your kitchen cupboard, but there's good evidence to suggest that the bright yellow spice deserves to be in your medicine cabinet too thanks to its effective anti-inflammatory properties. The active ingredient in turmeric is curcumin, a compound that lowers two enzymes associated with the body's inflammatory response. In a 2014 study from the University of Barcelona, physically active males randomised to receive a daily dose of 200mg of curcumin 48 hours before a downhill running test, experienced less pain and muscle damage than a control group. A tablespoon of curcumin contains around 136mg of the active ingredient, so try adding to curries, stews, rice salads and smoothies, or for an easier way to dose, consider curcumin supplements — up to 1,000mg a day has been used, and is considered safe.

Whey protein

Proven portion
25g/one scoop
Why eat it To support muscle growth

Nutrition
Kcal: 115
Carbs: 2g
Protein: 24g
Fat: 1g

Though protein doesn't necessarily play a role in acute recovery, it's vital in helping the body create new muscle tissue, especially when combined with a strength-training programme. Studies show that if protein is eaten close to a workout, muscle protein synthesis is increased to a greater degree than with a workout alone. According to Professor Stuart Phillips, expert in protein metabolism at McMaster University, Ontario, whey protein is more effective than casein or soy at stimulating new muscle synthesis at both rest and post exercise, thanks to its rapid digestion and speedy delivery to the muscle. Aside from rapid transit, whey's second secret weapon is a high level of leucine, a branch chain amino acid that acts as a trigger for new muscle growth. Supercharging your portion size isn't necessary though — research shows 20-25 grams of whey protein is enough to stimulate the maximal response.

Avocados

Proven portion
75g/one medium half
Why eat it To boost vitamin absorption

Nutrition
Kcal: 120
Carbs: 6g
Protein: 2g
Fat: 11g

The fats in avocado are not to be feared — they're predominantly monounsaturated, the kind that have been linked to better heart health and better cholesterol profiles. But that's not their only benefit — add a few slices of avocado to your salad and you'll amplify your body's absorption of fat-soluble antioxidants, which help repair exercise-induced oxidative damage. In one study, volunteers eating salad with 75 grams of avocado — around half a medium fruit — absorbed 13 times more carotenes and four times more lutein than when eating the salad without avocado. As an added plus, avocados boast more potassium than a banana, so can help to restore fluid balance after a long ride. Chop over salad, or add a quarter to a green smoothie.

Tomato juice

Proven portion
150ml
Why drink it To reduce muscle damage

Nutrition
Kcal: 36
Carbs: 7g
Protein: 2g
Fat: 0g

Thanks to the actions of the potent antioxidant lycopene, tomato-rich diets have been shown to lower the risk of prostate cancer by around 20 per cent, but there's another benefit of downing a glass of tomato juice — it can actually support muscle recovery. Swedish researchers found post-exercise oxidative damage was suppressed when volunteers consumed a daily dose of 150ml of tomato juice for five weeks. In 2013, Greek scientists conducted similar tests to see how tomato juice fared against a sugary drink for recovery, finding lower levels of muscle damage in the athletes consuming tomato juice. As well as ticking off one of your five-a-day, the sodium in tomato juice also helps your body suck up more fluid than plain water, which can help replace lost fluids after a lengthy ride.

Bananas

Proven portion
One banana per 30 mins
Why eat them
To delay fatigue

Nutrition
Kcal: 110
Carbs: 29g
Protein: 1g
Fat: 0g

The real-food alternative to an energy gel, bananas are rich in carbohydrate and come conveniently packaged in the ideal portion size. Granted, a team of scientists didn't develop them, but research shows they can be as effective as a commercially researched sports drink when it comes to delaying fatigue. In a 2012 study, Memphis University researchers pitted the fruit against Gatorade in cyclists performing a 75km time trial and found cycling performance was similar between conditions when carbohydrate intake was matched. For a 70kg male, that means consuming around one banana every 30 minutes. On longer rides this might not be feasible, but for shorter rides or as a pre-ride glycogen top-up, the banana is your go-to.

Beetroot juice

Proven portion
70ml concentrated shot
Why drink it To boost oxygen delivery

Nutrition
Kcal: 71
Carbs: 17g
Protein: 2.5g
Fat: 0g

Down a shot of beetroot juice before you hop on the bike to benefit from increased blood flow and a performance boost. According to Andy Jones, Professor of Applied Physiology at Exeter University, the nitrates in beetroot juice dilate blood vessels, increasing the supply of oxygen and nutrients to the working muscles, which can increase tolerance to exercise and reduce oxygen cost. In one study of runners, time to exhaustion was delayed by around 15 per cent following four to six days of nitrate supplementation. Jones's study shows that beetroot juice is an effective source of nitrate, which works as efficiently as a synthetic source for improving performance. "The amount of nitrate required for benefit is contained in about four whole beetroots, 500ml of 'normal' beetroot juice, or 70ml of a concentrated sport 'shot'," reports Jones. As the juice tastes earthy, a shot is an easy option.

For more ideas about what to eat and drink to help improve your performance, see our A-Z guide to sports nutrition on pages 86-89

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The big TOAST trends

The nation has gone crazy for gourmet toast. Toaster sales are up, and grilled bread has become the dish de jour – so why save it for breakfast?

As a cyclist, cutting corners on food prep is a godsend. Fewer hours spent in the kitchen means more hours on the bike, and when it comes to recovery meals, the faster the better. So why not make more of your daily slice? Toast is arguably the perfect fast food for a cyclist — it's rich in carbohydrate to help you fuel and recover, it comes in wholegrain varieties which means it releases energy slowly, and it's an ideal vehicle for any number of toppings from fruit to cheese, vegetables and more.

If you're guilty of slathering nothing more adventurous than jam over your two slices, it's time to shake up the way you think about toast.

Make sure you have a firm base for your toppings – granary, rye and sourdough are good choices, plus they have the added benefit of providing slow-release energy

GREEK YOGHURT, MASHED RASPBERRIES AND HONEY

Build it: Spread 100 grams of Greek strained yoghurt over two slices of rye or sourdough toast, top with fork mashed raspberries, and drizzle with a tablespoon of honey.

Benefits: If you're a sucker for jam on toast, this is the better-for-you version that can help you recover from a ride. The combination of carbohydrates from toast plus honey will replenish glycogen stores, with an added bonus — in a recent study from Azad University, endurance athletes undergoing treadmill training experienced improvements in levels of anti-inflammatory markers when supplementing their diet with 50 grams of honey a day. With twice the protein of regular yoghurt, Greek strained yogurt will take care of muscle recovery — the thick texture also makes it ideal for spreading over toast, with no fear of it dripping over the sides of your slice. Mashed raspberries add a burst of antioxidants to help your cells recover from your workout — but any soft fruits work brilliantly.

SMASHED AVOCADO AND CHILLI

Build it: Pop half a ripe avocado from its skin, add a squeeze of lime and roughly mash over a slice of granary toast. Top with a shake of chili flakes and a pinch of salt.

Benefits: According to Google trends, the obsession with avocado toast has gone global, with searches for the toast topper at an all time high. It might sound like a fad, but there's good reason to slather the buttery fruit on your bread. Avocados are packed with monounsaturated fats, the sort that can keep your cholesterol in check. In a 2015 study from Pennsylvania State University, overweight adults given a daily dose of avocado reduced their levels of the small dense LDL cholesterol particles that can predict heart disease risk. But that's not all — the fat-rich content can also help you feel satisfied after eating. According to researchers at Loma Linda University, adding half an avocado to lunch can increase satiety for three-five hours, which means you're less likely to break out the biscuits before you hit the road home.

Photos: Simon Bevan, www.timeincukcontent.com

NUT BUTTER AND BANANA

Build it: Spread one tablespoon of almond or peanut butter over two slices of wholegrain toast and top with a sliced banana

Benefits: Bananas are classic cycling fuel — according to a survey from online retailer Wiggle, bananas are the number one favourite riding fuel of UK cyclists, and for good reason. Providing 30 grams of readily absorbed carbohydrate per fruit, they can fuel exercise as effectively as sports bars and gels, plus they're cheaper. The banana sandwich is a long-time favourite, but to turn your banana toast into longer lasting fuel, simply add a slick of nut butter. The healthy fats in nuts slow the rate at which the meal is digested, which regulates energy levels, keeping you fuelled for longer. In one study published in the British Journal of Nutrition, women adding peanuts or peanut butter to a breakfast containing 75 grams of carbohydrate experienced better blood glucose control, increased satiety and fewer cravings compared to a control group.

RICOTTA, BEETROOT AND ROCKET

Build it: Slick 50 grams of ricotta or light soft cheese over two slices of wholegrain toast, slice two cooked beetroot into eights and pile over the toast with a few sprigs of rocket and a drizzle of balsamic glaze.

Benefits: Balanced meals are vital for staying fuelled on the roads — you want sufficient carbohydrate to keep your legs moving, but you need to ensure that it's not burnt up in the first half hour. Tick the boxes with a pre-ride combo of beets, ricotta and toast. The toast provides the energy boost and the ricotta adds a nice dose of protein to balance energy release without being too heavy on fat content. Finish your toast and give yourself a pre-workout boost with a couple of beets — the naturally present nitrates dilate blood vessels increasing blood flow to the working muscle during exercise. No ricotta in the fridge? A lower fat soft cheese will work just as well.

MACKEREL, HORSERADISH AND CUCUMBER RIBBONS

Build it: Spread a slice of sourdough toast with a teaspoon of horseradish. Mash half a smoked mackerel fillet and use to top the toast. Slice a few cucumber ribbons over the top of the toast. Season with black pepper and serve.

Benefits: Oily fish is one of your best natural options for fighting inflammation — according to scientists at the Harvard Medical School the omega 3 oils contained in the fish increase the body's production of resolvins, compounds which turn off the migration of inflammatory cells. Mackerel is also one of the few naturally occurring sources of vitamin D, which has been shown to regulate immune function. A 3oz serving will give you 100 per cent of the daily vitamin D recommendation, which means even if the sun doesn't shine, you'll get your daily dose. The classic partner for mackerel, horseradish boasts its own health benefits — the root contains a compound called allyl isothiocyanate, which is thought to have anti-bacterial properties.

LABEL LOWDOWN

The traffic light system used by many manufacturers makes food labels easy to understand. Here's all you need to know

Some food manufacturers use a traffic light scheme to inform consumers about the content of their products. It's a fairly simple idea: red for high levels, amber for moderate and green for low. In basic terms, the more green on the label, the healthier the product.

Learning how to read food labels quickly can help you make better choices in the supermarket, resulting in better quality meals. Of course, some of the best foods come without labels: whole foods such as fruit, veg and grains. The first rule should be, simply: fill your trolley with as much fresh food as possible.

1 It's important to read the overall content of the food. It's easy to get misled by marketing slogans that shout 'low in fat' or 'sugar-free'. You should be more interested in what the food *does* contain. Sugar and fat provide food with taste and texture; many low-fat foods are actually high in sugar, which compromises the 'healthy' claim. A recent UK study found that 10 per cent of diet foods contained as many or more calories than their non-diet equivalent, and 40 per cent contained more sugar.

2 Though many companies have voluntarily cut the amount of salt in their products, many processed foods still contain high levels. Salt is found in all kinds of unexpected places — in foods that don't taste at all salty. It is sometimes called sodium chloride, and some food labels state only the figure for sodium. But there's a simple way to work out how much salt you're eating: salt = sodium x 2.5. A product is high in salt if it contains more than 1.5g salt per 100g (or 0.6g sodium) and low if it contains 0.3g salt or less per 100g (or 0.1g sodium).

3 For every 10g of carbohydrate listed on the label, a food should contain at least one gram of fibre. That's the ratio of carbohydrate to fibre in unprocessed wholegrain. The recommendation comes from a study published in the journal *Public Health Nutrition*, which evaluated hundreds of grain products. The foods that met the 10-to-one ratio contained less sugar, sodium and trans fats. Fibre also helps to fill you up, is good for your gut and helps reduce blood cholesterol.

4 Ingredients are listed in order of volume. Check the first three ingredients and decide whether they're healthy. This helps you work out, roughly, the nutritional quality of the product. Take a chocolate bar: if the first listed ingredients are sugar, whole milk powder and cocoa, you know it contains less cocoa than sugar.

5 Another trick used to make foods appear healthier than they are is to state that they contain more portions than they actually do. At first glance, the values look healthy — but they're based on two portions. If you eat the entire packet in one sitting, it may not be as healthy as it seemed. This is commonly the case with cakes: the packet may claim that it serves eight, but who actually cuts a cake into such puny slivers?

A-Z SPORTS NUTRITION

Just like bike design, sports nutrition is constantly evolving. Covering every aspect, from pre-ride fuelling to recovery, *Laura Tilt* guides us through the foods and supplements that claim to offer a winning edge

A IS FOR ALANINE

An essential amino acid, beta-alanine increases the body's levels of carnosine, a compound stored in the muscle which buffers acidity during high-intensity efforts. Daily supplementation of around four to six grams for two to four weeks can benefit performance during short bursts of hard effort — think sprints and breakaways.

B IS FOR BEETROOT

Beetroot seems an unlikely cycling partner, but the earthy vegetable is high in nitrates — compounds that increase blood flow and improve oxygen efficiency. Beetroot is now a regular on every pro cyclist's menu. In one 2011 study of club-level competitive cyclists, a 500ml dose of beetroot juice 2.5 hours pre-event improved time trial performance by around three per cent. For an easier way to get the same result, try a 70ml sports shot.

C IS FOR COCONUT WATER

Thanks to its electrolyte content, coconut water has gained favour as an all-natural sports drink and rehydration fluid. It has five times the potassium content of isotonic drinks, but that's where the good news stops. The American Chemical Society concluded that the sodium content of coconut water isn't sufficient to replace sweated-out losses. Since sodium is essential for maintaining blood volume needed to transport oxygen and dissipate heat during exercise, you may be better off with a sports drink. One to save for recovery.

D IS FOR DAIRY

With the influx of alternative, trendy milks such as almond and coconut, the cow type has received a bit of a bashing. But its benefits for cyclists are still important. Milk contains both slow and fast-release proteins, natural sugars and sodium in quantities that make it the ideal recovery drink. In one study from Texas, trained cyclists drinking chocolate milk after a 1.5-hour training session performed better in a subsequent time trial than those who drank a carb-only drink. And don't forget the calcium benefits: not only does milk boost bone health, it also helps regulate body fat.

E IS FOR ELECTROLYTE TABS

If you're riding for an hour or more, plain water may not be enough. You may benefit from replacing sodium lost through sweat to maintain blood volume and muscle contraction. Electrolyte tabs can be added to plain water, which means they're ideal for rides of 60-90 minutes or in hot weather. Just remember to also consume some carbs if you're on a longer ride.

F IS FOR FLAVONOIDS

Found in plant foods, flavonoids act as antioxidants, helping buffer the increase in oxidative stress that comes as a result of intense exercise. Studies show that high intakes of flavonoids can limit exercise-related inflammation and muscle damage, as well as protecting against heart disease and cancer. Get your kick from brightly coloured fruits and vegetables, tea and red wine. ›

Photos: Jesse Wild, www.timeincukcontent.com

THINKING OF SUPPLEMENTING?

The IOC recommends considering the following:

Is it safe?

Is it legal?

Is there evidence that it works at the dose recommended?

Do I know the correct way to take it?

Can I afford it?

G IS FOR GREENS POWDER

Greens are good, but if you don't like eating them, you can now put them in a drink or on your porridge in the form of a powder. A concentrated source of so-called 'superfoods' spirulina, chlorella and wheatgrass, it's claimed that green powders can meet shortfalls in your fruit and veg intake, helping to increase antioxidant defences. The scientific jury is still out about the benefits, but that hasn't stopped the British cycling team using them.

H IS FOR HONEY

As the trend for natural fuel grows, honey has been promoted as an alternative sports gel. The substance lovingly created by bees is a blend of two sugars (fructose and glucose) and scores medium on the glycaemic index, which means it releases energy steadily. Evidence is limited, but researchers from the Exercise and Sport Nutrition Lab at Memphis University found honey mixed with water was as effective as a dextrose gel for fuelling time trial performance in trained cyclists. Two to three tablespoons an hour will meet the recommended 30-60g of carbohydrate needed to delay fatigue — squeeze into the corner of a sandwich bag, twist, and tie the top to make DIY gels.

I IS FOR ISOTONIC GEL

Manufacturers of the "world's only truly isotonic gel", sports nutrition leader SiS claims the specially formulated Go Isotonic energy gel provides a quicker supply of energy to the muscle than regular gels because it contains the same ratio of water to solutes as your body's cells and blood, making it more readily absorbed.

J IS FOR JELLY BEANS

According to scientists from the University College Davis in California, sports beans (jelly beans with added electrolytes and B vitamins) are effective for fuelling endurance exercise. In the experiment, cyclists who ate the sports beans during a 10km time trial performed 32-38sec faster than those who drank only water. Jelly beans are a viable alternative to gels when it comes to fuelling your ride, as they're a source of fast-digesting carbohydrate.

K IS FOR KETO-ADAPTATION

As the body's limited ability to store carbs is one of the main causes of fatigue during hard exercise, using fat for energy has an obvious advantage. In theory, the idea is great: train your body to use fat over carbs and effectively you'll never bonk. Unfortunately, the science has failed to show any clear benefit. Yes, you burn more fat after exposure to a low-carb diet, but this doesn't translate to any improvement in performance. In fact, this approach could actually blunt your body's ability to use the carbs needed for high-intensity efforts.

L IS FOR LEUCINE

An essential amino acid (or protein 'building block'), leucine has been found to be the key to 'switching on' new muscle synthesis. There's no need to splash out on a leucine supplement — consuming around 20-25g of protein from a leucine-rich food after high-intensity rides is sufficient to max out the response. Top sources include whey, milk, eggs, poultry and fish.

M IS FOR MULTIPLE TRANSPORTABLE CARBS

When it comes to delaying fatigue during rides, two carbohydrates are better than one – so says the research behind the latest range of products such as Power Bar's C2Max, which boast multiple transportable carbs. Studies show carbohydrate uptake during exercise is limited to the amount the gut is able to absorb, i.e. 60g an hour, in the case of glucose. Fructose, however, is absorbed along a different pathway, so by adding the two together you can boost the amount of carbohydrate available to the working muscle. In a 2007 study from the University of Birmingham, this translated to an eight per cent improvement in time trial performance.

N IS FOR NATURAL FUEL

Sports nutrition might be evolving, but the desire for simpler times with more natural foods — as well as transparency in terms of ingredients — is growing. According to a 2013 survey from Mintel, 67 per cent of UK consumers rate natural as better than synthetic as far as sports foods are concerned. Working alongside endurance athletes, the well-known Clif Bar brand is pioneering sports fuel using real food ingredients; their raw materials include sweet potato and sea salt and pizza margarita. Pizza turned into an energy bar? Yes, really.

O IS FOR OMEGA 3

Research suggests the healthy fats found in oily fish are one of the best natural defences against exercise-induced inflammation and muscle soreness. Greek researchers found adults eating more than 300g of fish per week had 33 per cent lower levels of inflammatory markers than those eating no fish. A lesser-considered benefit is on cycling efficiency. In one 2014 study from the University of Wollongong in Australia, eight weeks of low-dose fish oil supplementation improved oxygen efficiency and heart rate recovery. Aim to chomp through two servings of oily fish a week — or consider a supplement.

P IS FOR PROTEIN

If there's one macronutrient with a health halo, it's protein. The ideal accessory for weight loss, strength gains and muscle recovery, protein products are dominating sports nutrition sales across the world. And the science seems to support the claims, with clear benefits for weight loss — up to double the recommended daily intake (1.6 v 0.8g/kg) has been shown to boost the rate of fat loss while preserving lean muscle. Include a decent protein source in each meal and snack to benefit. Also, plant proteins are set to be the next big thing.

Q IS FOR QUERCETIN

A flavonoid found in fruits and vegetables, quercetin leapt into the limelight as a performance-booster following research showing it could boost VO2 max and reduce post-exercise inflammation. In one 2009 study of healthy untrained cyclists, seven days of supplementation increased time to fatigue by an impressive 13 per cent, but not all studies have been as positive, particularly in trained subjects.

R IS FOR RICE CAKES

If you're sick of guzzling gels and energy bars to fuel your rides, try rice cakes. Developed by sports physiologist and cycling coach Allen Lim, the savoury cakes are popular with Garmin and Team Sky riders. Low-fibre, high-glycaemic rice is cooked and combined with bacon, egg, salty soy sauce and a pinch of sugar to provide the carbs and sodium needed to replenish energy and electrolytes. Check online for recipes.

S IS FOR SODIUM BICARBONATE

One of the popular buffering agents, sodium bicarbonate can help regulate muscle pH during all-out efforts. Studies show this can reduce pain and muscular fatigue when taken in doses of around 0.3g per kilo of body mass pre-event. Taking bicarbonate in capsules can help to reduce any GI side effects — but as with any supplement, it should be tested during training, not on event day.

T IS FOR TOMATO JUICE

The claimed hangover cure tomato juice is worth keeping in your fridge for after a ride — not just for after a night on the booze. The sodium-rich juice is ideal for replenishing salts and fluid lost during hard exercise. What's more, the lycopene in processed tomatoes can help your muscles recover too. According to Swedish researchers, a dose of 150ml of tomato juice after exercise can help suppress the increase in oxidative stress associated with high-intensity training.

U IS FOR ULTRA COLOSTRUM

Sold by sports nutrition supplier Myprotein, ultra colostrum is a powdered supplement produced from bovine milk. Containing high levels of antibodies and immune-boosting compounds, the dairy-based supplement is sold on the back of research showing benefits of immunity and gut health. Initially popular with pro cycling teams, WADA's recommendation to avoid the supplement due to its naturally high levels of growth factors means it has fallen out of favour with the pros.

V IS FOR VITAMIN D

Getting enough of the sunshine vitamin isn't just vital for strong bones, it can also stop you getting sick. Researchers from Loughborough University found endurance athletes with the highest levels of vitamin D had had the fewest chest infections and severe symptoms during winter training. Oily fish and eggs are the only dietary vitamin-D boosters, so it's worth considering a supplement during winter.

W IS FOR WHEY

Rich in branch-chain amino acids and fast-digesting proteins, whey has secured its crown as one of the most popular sports nutrition products out there. Shoot a scoop of the milk-based protein into a post-workout shake to boost muscle repair or use as a convenient top-up between meals to stamp out hunger.

X IS FOR XYLITOL

With sugar under fire, alternative sweeteners are gaining traction. Produced from plant material, xylitol contains one-third fewer calories than sugar and, though it tastes sweet, reduces levels of decay-triggering bacteria in the mouth. Try in place of sugar to cut calories, reduce tooth decay and perhaps even lose weight.

Y IS FOR YOGHURT

Greek yoghurt has soared to the top of the charts because of its protein content, but there's another reason to add it to your diet — the natural probiotics can help stimulate immune function, which could strengthen your defences during weeks of intense training.

Z IS FOR ZINC

Most closely associated with immune function, low levels of zinc can interfere with wound healing and tissue growth. Thus, getting enough zinc is important for fending off illnesses, especially during periods of hard training. Protein has a positive effect on zinc absorption, so choose lean meat and fish together with zinc-rich foods such as nuts, seeds, cocoa and beans to top up zinc levels the natural way.

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STRETCH YOURSELF FASTER

Investing in aerodynamics isn't all about expensive frames and hidden components. As *Lexie Williamson* explains, it's about putting the time into making your body aero, too

View Sir Bradley Wiggins side-on in full time trial glory (gold shoes and all) and you are looking at a pretty perfect TT position: flat tabletop back to reduce wind resistance; tucked in arms to minimise frontal exposure; and head looking forwards.

But for most cyclists, even some of Wiggin's fellow competitors, that kind of aggressive aero stance is impossible to achieve, let alone maintain. It's no good starting a race in an aggressive stance if you are forced to sit up with a sore back 10 minutes later and ultimately lose your speed.

We know the drag-reducing benefits of dropping lower, whether on a TT bike or just riding more on the drops, but for the average recreational cyclist it can be a frustratingly uncomfortable position to ride in.

There are a number of reasons for this but hamstrings are a good place to start. The average weekend warrior is likely to have tight hips and hamstrings. This matters because when hamstrings reach their maximum limit in an aero position the back is forced to flex (bend) more.

This leads to more of a camel hump than the desired tabletop, and places pressure on the erector muscles of the back, sometimes leading to spasm or cramping, and places pressure on the discs. It can also lock out the hips, leaving little wiggle room if the rider needs to adjust the sitting position, and it can even reduce leg power.

A lower stance also heaps pressure on the neck extensors or muscles that lift the head. Due to the S shape of the spine, when the back bends, the neck extends so the head is held in a more extreme extension on the drops or on a TT bike to allow the rider to look forwards.

So do we change the body or the bike in order to find a comfortable lower stance? The answer is a bit of both: a two-pronged man-and-machine approach that begins when you buy the machine.

POST-RIDE STRETCHING HELPS ALLEVIATE SORENESS AND LEAVE THE LEGS FRESHER TO RIDE AGAIN

A bike that makes you drool in anticipation but forces you into such an aggressive position that you are unable to move your back, neck or adjust your hips is probably going to be an unwise buy. Once happy, a good bike fitter will ease you into a more sustainable position, progressively over a number of visits, and this is a sensible first step.

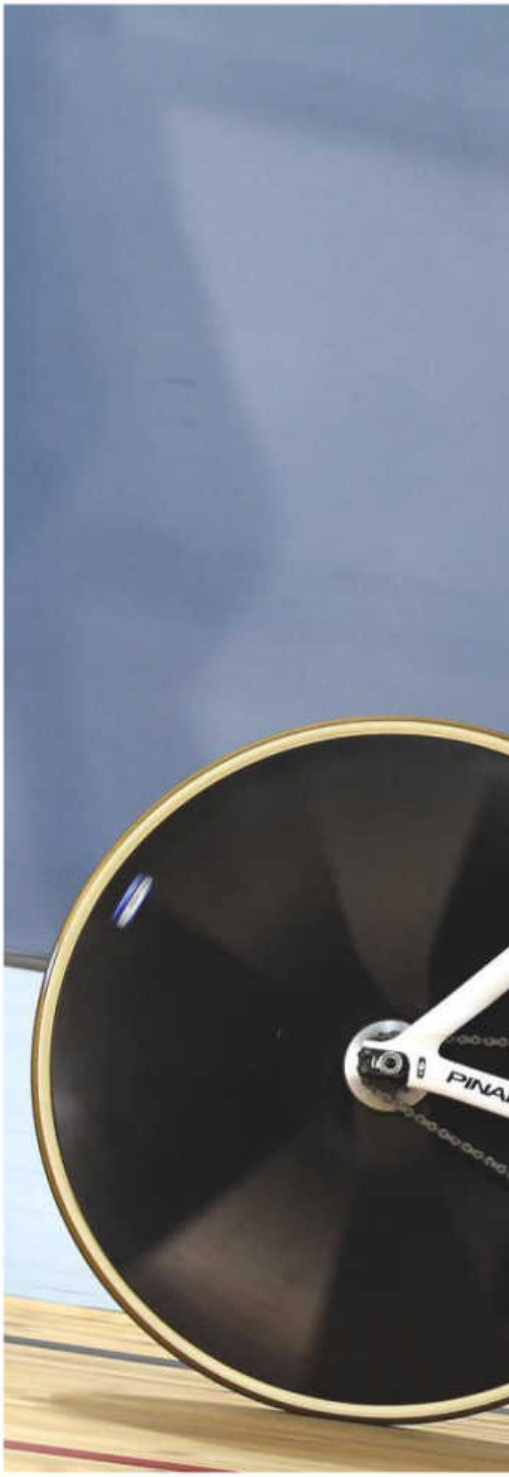
Bike fitter Nicholas Dinsdale claims anyone can ride a TT bike through a combination of fitting and body conditioning. His NJD Sports Injury Centre offers yoga and Pilates.

So what about the human element? This article is addressing what you can do off the bike to get lower, primarily through stretching but by also including a little strength advice.

First the bad news: supple riders like Wiggins and Fabian Cancellara owe some of superior flexibility to their bendy genes, as the composition of elastin and collagen of our connective tissue is determined by birth. The pro riders are of course also younger (we stiffen up with age, if you hadn't noticed) and don't have to sit in an office for a large proportion of the week.

The good news (if you can call it that) is that flexibility can be improved through regular and diligent stretching. Flexibility training is an integral part of both pro cyclists' strength and conditioning regimes.

Nicole Oh, cycling physiotherapist,



Photos: Andy Jones, Mike Prior

Bradley Wiggins rides in the perfect 'tabletop' aero position

national level road racer and Les Filles racing team founder, advises stretching little and often to see real results on the bike; holding a stretch 20-30 seconds, three times and repeating twice a day.

This sounds like a commitment but a 'stretch' can be as simple as putting your leg on a chair and leaning forwards — something that can be done in the office.

Flexibility training is not the only answer. Strength work, particularly reinforcing the core, should also be practised (see box). This can either be done on the mat through yoga or Pilates or at the gym.

Oh is an advocate of 'eccentric' (the lengthening of a muscle while it is under tension) techniques like the Romanian dead lift as it combines both strength and flexibility training and is very functional for cyclists. However, she warns that care needs to be taken to ensure absolutely correct technique while doing the lift to reduce the chances of lumbar spine injury.

The dead lift forces riders to maintain a neutral spine and engage the core, while both strengthening and lengthening the hamstrings. Oh also suggests trying the upright row technique as well as squats and any variation of the classic overall body strengthener, the plank.

Whether you are a time triallist or want to gain the aero advantages of riding more on the drops, stretching and some strength work can go a long way to achieving and comfortably maintaining a lower position.

LIMITING THE POSTURAL IMPACT OF THE DESK JOB

The 9-5, or 9am to 7, 8 or 9pm as it commonly extends to now, can impact the cycling position. Sitting for prolonged periods with the hips flexed to 90 degrees can create tight hamstrings, a weak core and rounded back. So if you are desk-bound all week and wanting to jump on a TT bike or ride more on the drops at the weekend, it is worth remembering to sit correctly with a neutral spine or with the natural curves of the spine intact. Also try to change position, maybe arching the back or rotating the spine by twisting gently from side to side and take regular walking breaks. See the chair hamstring stretch in 'Four stretches to get aero', for an easy desk-based stretch.

THE WAITER'S BOW TEST

The 'sit and reach' test used to be the main assessment method of hamstring length, but apart from humiliating the majority of the population as they grasp in vain for their feet. It tells us little and can strain the lower back. A great test not just to assess hamstring length, but also get an idea of your body's ability to achieve and hold an aero position, is the waiter's bow. It demonstrates hamstring length in a more cycling-specific position, as well as quickly revealing the degree of core strength and a rider's awareness of the position of his lower back and pelvis.

- Stand with the feet hip-width apart, hands on hips.
- Hinge forwards at the hips (not the lower back) maintaining a neutral, tall spine and the shoulder blades slightly drawn together.
- Lower as far as hip flexibility will allow or stop tilting the moment the back wants to round.
- Keep the knees stable but not locked.

"Cyclists will often be unable to hold their trunk in the lean forward or waiter's bow position due to poor awareness of lumbopelvic (lower back/pelvis) position or lack of core stability or endurance," explains cycling physiotherapist Nicole Oh. "This means that even if they can get into the correct aero position they will find it difficult to maintain."

FOUR STRETCHES TO GET AERO

1 THE CHAIR HAMSTRING STRETCH

HOW TO Tight hamstrings are the main barrier to achieving a low bike position, but choose a stretch where you can keep the back straight and avoid the back rounding as this will just place stress on the discs and ligaments.

Place one foot up on a chair seat, or lower surface such as a step, and lean forwards maintaining a neutral spine.

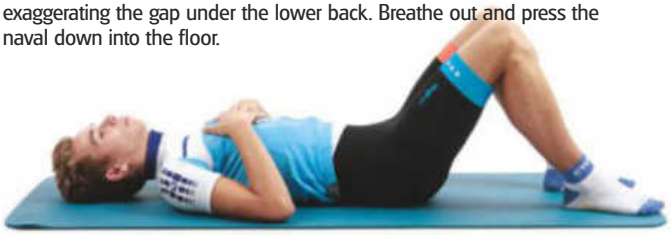
PERFORM THE STRETCH THREE TIMES AND REPEAT LATER IN THE DAY

HOLD FOR 30-60 SECONDS

2 THE PELVIC TILT

HOW TO The pelvic tilt movement improves a rider's awareness of the lower back and pelvis so they are better able to alter it while riding. Once mastered this movement can be done sitting, making it a useful desk exercise.

Lie on your back with the legs bent and feet hip width apart. Keep the pelvis on the floor throughout. Breathe in and lift the naval up exaggerating the gap under the lower back. Breathe out and press the naval down into the floor.



REPEAT FIVE TIMES

3
THE BACK STRETCH

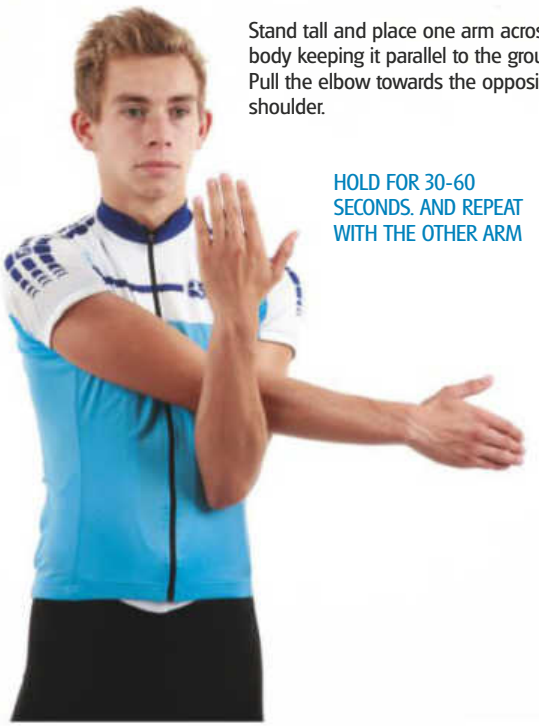
HOW TO A rider's back muscles can become locked and rigid due to hours spent in a constant state of contraction. A good stretch for the latissimus dorsi, the broad back muscle, may help you drop lower and is also useful for easing out an aching back after a ride. This stretch can either be done on the floor or by standing and placing the hands on the back of a chair, making it another handy office stretch.

From an all fours position slowly sit back into a kneeling position. Walk the hands forwards until the arms are straight. Spread the fingers and press the hands into the floor. To go deeper, draw the hips back in the opposite direction, lift the head off the floor and tuck the chin in.

HOLD FOR 30-60 SECONDS

4
THE SHOULDER STRETCH

HOW TO A good degree of upper body flexibility is required to tuck into the aero stance. This shoulder stretch may help achieve the narrow frontal area that especially TT riders desire, by stretching the muscles behind the shoulder such as the rhomboid and trapezius.



Stand tall and place one arm across the body keeping it parallel to the ground. Pull the elbow towards the opposite shoulder.

HOLD FOR 30-60 SECONDS. AND REPEAT WITH THE OTHER ARM

CASE STUDY

Matt Bottrill, the British national time trial champion over the distances of 10, 25 and 50 miles, partly credits his enviable TT position to regular off-bike conditioning.

"I do two to three sessions of core, strength and Pilates every week for around 15-30 minutes," says Bottrill. "I find it allows me to hold a better aero position on the bike. Especially now that I'm getting older I find I have to keep on top of my strength work to stay strong and flexible."

Bottrill, runs a coaching company and is a father of three, and admits it is easy to skip this kind of conditioning, especially in light of additional work and family commitments. "I basically do everything from home, just using DVDs," he says. "This takes away the time of travel to the gym. You have to be disciplined to add it to your training."

Bottrill's thrice-weekly workout gets him aero

STRENGTHEN YOUR WAY AERO

Stretching alone is not the only answer to dropping lower on the bike: you'll need the core strength to stay there too. There are two main potentially weak areas that require reinforcing for a lower riding position: the lumbopelvic (lower back/pelvis) and scapulothoracic (shoulder blade/upper back). Here are two techniques based on the locust yoga pose to reinforce these potentially weak areas:

1 SCAPULA SEQUENCE

HOW TO Supreme upper body strength is required to comfortably hold the aero stance. This series of arm positions will work on the muscle groups that stablise the scapula or shoulder blades. Lie face down, resting on the forehead.

T arms — bring the arms in line with the shoulders, palms facing forwards. Remain looking downwards. Inhale and raise the upper body. Exhale and lower. Repeat four times.

Y arms — bring the arms a little further forwards so that they form a Y shape with your body, and then lift and lower four times.

W arms — bend the arms into a W shape by drawing the elbows back and lift and lower four times.

AFTERWARDS RISE TO ALL FOURS AND SLOWLY SIT BACK ON THE HEELS TO STRETCH THE LOWER BACK

Lexie Williamson is the author of *Yoga for Cyclists*.

Her style of yoga is called Vinyasa Flow. This is a dynamic form of yoga where movements are synchronised with breathing to stretch and strengthen the entire body.

2 LOCUST LEGS

HOW TO To shift the focus to the lower back, return to lying face down but with the arms by the sides, palms facing downwards. Keep the upper body on the floor and raise and lower one leg at a time. Repeat five times on each leg.

AFTERWARDS RISE TO ALL FOURS AND SLOWLY SIT BACK ON THE HEELS TO STRETCH THE LOWER BACK

Cycling ACTIVE

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RECRUIT YOUR GLUTES

There's a fair chance you're not firing on all cylinders, according to former pro Ben Hallam. *Lexie Williamson* explains how to tune up your motor with some simple exercises and techniques that will bring new levels of power to your pistons

Photos: Daniel Gould

Sore lower back, aching quads, hamstring niggles, IT band trouble or lack of power? You may be sitting on the solution.

According to Ben Hallam, head of bike fitting at Bespoke Cycling and ex-professional cyclist, most riders know how to fire their quads but "massively under-activate" their buttock muscles or 'glutes'.

Maximus, the biggest of the glute trio, is the largest and strongest muscle in the body so that's a lot of riders neglecting a potentially potent source of pedalling power.

So how should the glutes ideally function in cycling?

The gluteus maximus is designed to be the prime mover, or 'agonist' for hip extension. This occurs in cycling with every downward push on the pedals.

However, if the glute max is weak — as it is in many cyclists — the hamstrings take on this primary agonist role rather than being the 'synergist' hip extensors assisting with the movement.

This places huge pressure on the hamstrings, which become easily overworked and injured.

The second two glutes — medius and minimus — are located on the side of the buttocks. They act as rotational and lateral movers of the leg and stabilise the hips during cycling to prevent rocking and rolling.

If these smaller muscles are weak, the power flow from the glutes to the pedals is disrupted. Lack of strength here can also lead to injuries lower down the leg, particularly the knee.

"Weak hips increase the reliance on the knee to produce more of the force," explains Hallam. "Without the hip-stabilising help of glute medius, the knee can drift inwards."

This inward knee drift places extra strain on the knee ligaments and tendons. The body can compensate by trying to stabilise the hip through the tensor fasciae latae (TFL) and the iliotibial (IT) band.

Many cyclists are familiar with the IT band; that thick fibrous sheath that travels down the side of the thigh to the knee. It's a common site of discomfort after a hard day's training.

Of most interest to cyclists, however, is the potential loss of power in the pedal stroke through not strengthening the glutes and the core generally.

"A cyclist with weak glutes lacks the foundation for a strong, effective pedal stroke," says Hallam. "Without this foundation the legs can't push from a solid base. It's like trying to fire a cannon from a canoe."

Of course, strengthening the glutes and learning how to switch them on while riding are crucial but just two key parts of the puzzle. It's also well worth investing in a professional bike fit to see if your bike set-up is further inhibiting glute activation.

For example, if the saddle is positioned too far forward the quads will take the workload (similar to the act of bending the knees in a squat position).

A low saddle or handlebars will further increase hip flexion at the top of the pedal stroke (the action of lifting the leg over the top of the pedal stroke) also making it harder to fire the glutes. Again, ›

the riding platform must be stable to allow the pistons (legs) to power the cranks whether it relates to bike set-up or strength of the rider.

This means not just having rock solid glutes but good overall core strength from the corset-like transversus abdominals to the abs at the sides of the waist (internal and external obliques).

So what about standing and climbing? For most cyclists this is the only time they really feel they are working the glutes. But are these muscles always functioning correctly out of the saddle?

Hallam's verdict is that if you can't fire the glutes in a stable, seated position then it's unlikely to happen in the wobblier standing stance.

Since researching this article I have become much more glute aware when cycling. Rather than hammering down with the quads I'm now consciously engaging the glutes at the top of the pedal stroke.

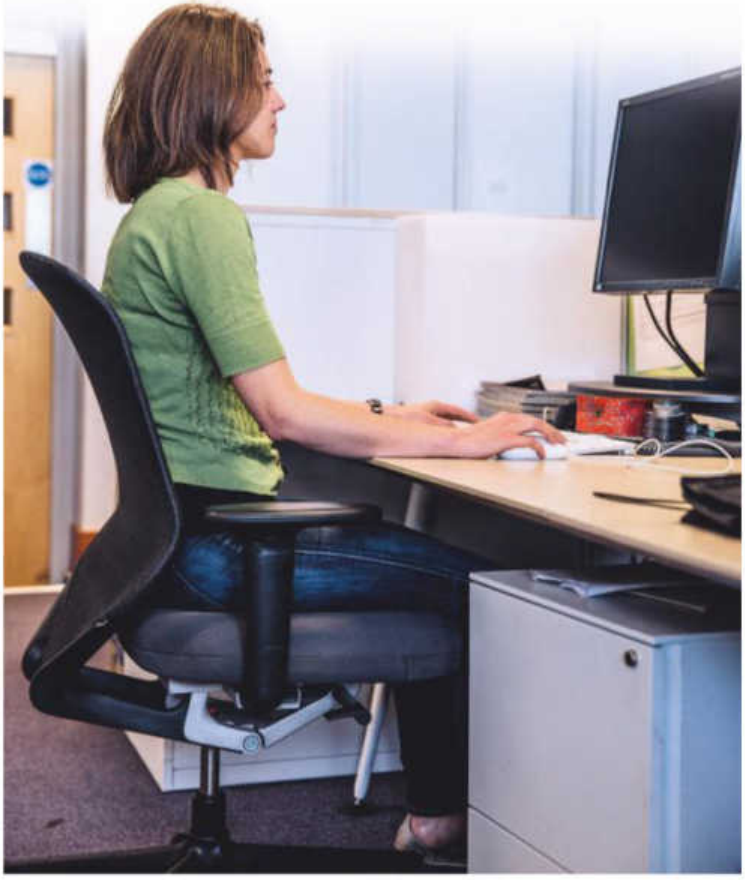
Result? A noticeable surge in power and speed on the flat and less of a spike in heart rate when standing and climbing. It's hard to describe but I feel like I'm riding lighter.

My long-suffering quads also ached significantly less as the workload was shared with the glutes (although the buttocks were still complaining two days later).

It's a bit like unearthing a secret power source. "You've discovered why I teach this," Hallam replies when I feed back. "Most cyclists carry around these engines and never use them."

WEAK GLUTES AND THE DESK JOB

Rather than squatting as our ancestors did (which promotes both hip flexibility and glute strength) we now sit for eight or nine hours a day at a desk. Aside from rounding the back, this flexed sitting position stretches the glutes and the prolonged static stretching inhibits glute activation. The hip flexor group of muscles at the top of the thigh also become short and tight making it more difficult to get these muscles to fire. This flexed seated position is very similar to the riding stance so if you are a desk-bound cyclist take regular breaks to walk around the office, do some basic lunge-type hip flexor stretches and gentle spinal extensions (back bends). Keep the glutes active with Ben Hallam's Seated Glute Activation Technique (see right) and try some desk-based squats (see Chair Squat Technique). Seek out conditioning classes offered by physiotherapists or try yoga or Pilates to offset time spent sitting.



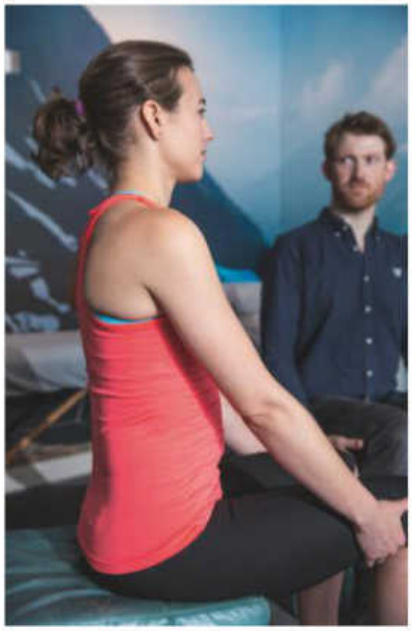
SEATED GLUTE ACTIVATION TECHNIQUE

This technique is about engaging the glutes early, at the top of the pedal stroke, so the muscles are fully activated by the middle of the power phase (three o'clock).

According to Ben Hallam, many cyclists are 'neutrally inhibited' when it comes to their backsides and need to be taught how to switch their glutes on and off.

Hallam has devised a six-step technique starting with activating both buttocks and ending with a slow simulated pedal stroke on the turbo trainer.

The chair-based stages of this sequence can be practised anywhere. Performing them prior to riding, while munching your morning muesli, will prepare the body's nervous system for firing these powerful muscles on the bike.



1) Sit on a chair with the feet hip-distance apart and firmly planted on the floor. Sit on the hands and clench the buttocks to see how the glutes feel when activated.

2) Squeeze and contract one buttock at a time.

3) Place the hands on the hamstrings (under the thighs). Clench the buttocks without activating the hamstrings.

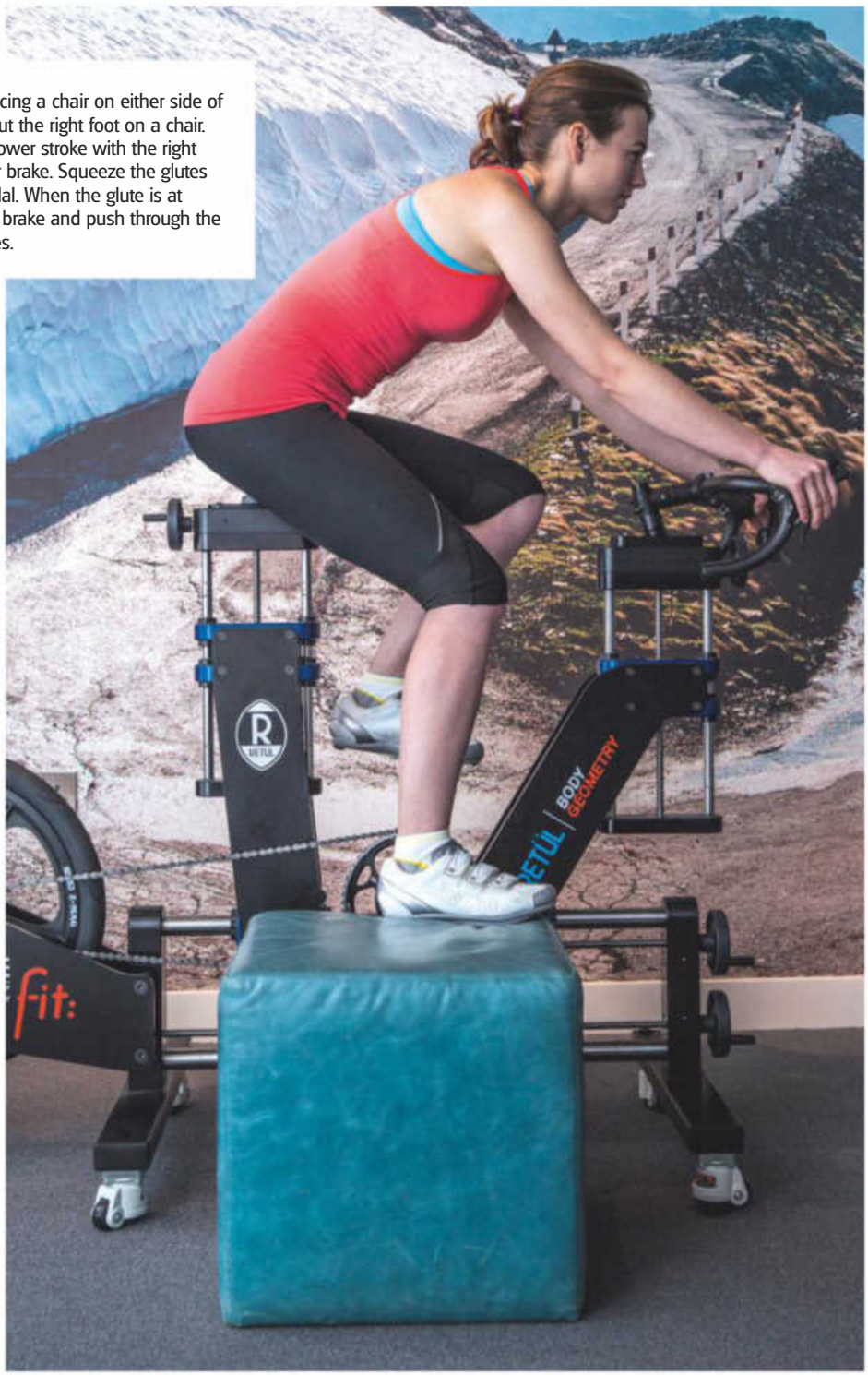
4) Clench one buttock at a time without activating the hamstrings.

5) Clench one buttock at a time while pressing the foot into the floor. As you squeeze the glute close your eyes and visualise pushing down at the top of the pedal stroke.

MASSAGING THE GLUTES

If you can't afford the joy of paying a professional to lean an elbow into the glutes, try self-massage using a foam roller, spiky rubber ball or tennis ball. Start tentatively by sitting on the roller with the legs bent and moving back and forth if the glutes are very sore. Alternatively place a ball in the middle of the buttocks and make small circular movements to go deeper. You will know when you've hit the spot.

6) Switch to the turbo-trainer, placing a chair on either side of the bike. Start with the left leg. Put the right foot on a chair. Start to pedal at the top of the power stroke with the right leg (12 o'clock) but apply the rear brake. Squeeze the glutes and push down on the fixed pedal. When the glute is at maximum activation, release the brake and push through the whole stroke squeezing the glutes.



MAT-BASED GLUTE STRENGTHENERS

The following series of exercises will work both the gluteus maximus and the smaller medius and minimus. Perform the techniques twice a week either prior to cycling to fire up the glutes, or between rides.

1) GLUTE ACTIVATING BRIDGE

Most riders are familiar with the bridge as a general back and body strengthener. To increase the glute max workload try the following steps.

1) Bridge preparation — lie on your back with the legs bent and the feet level and hip-distance apart. Place the arms by the sides, palms face down.

2) Flatten the lower back — draw one leg into the abdomen to press the lower back into the floor. Maintain this floor contact while returning the foot to the ground.

3) Slowly rise up to bridge without altering the position of the pelvis. You should feel a deep contracting sensation in the buttocks.

4) Hold for 5-10 seconds then lower and draw both legs into the abdomen.

2) CLAMS

'Clams' strengthen the gluteus medius, the smaller gluteal muscle at the side of the hips which has a key stabilising role in cycling.

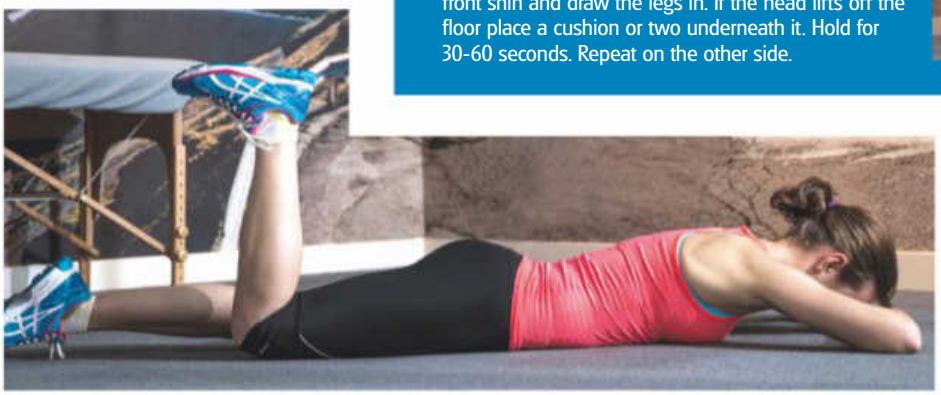
Level 1) Lie on your side with feet on the floor and legs stacked and bent at a 90-degree angle. Rest your head in your hand. Keeping the feet in contact, lift the top knee up until you feel a squeezing sensation in the outer hip muscle. Lower and repeat 5-10 times.

Level 2) Begin with the knees together and the feet apart. Repeat as before lifting the top knee up until you feel a squeezing sensation in the outer hip muscle then lower down, keeping the feet apart at all times. Repeat five-10 times.

3) GLUTE STOPWATCH TECHNIQUE

This exercise aims to isolate the gluteus maximus. The hamstrings will contract too, especially if the glutes are weak, but try to relax them so the buttock muscles do the majority of leg lifting.

Lie on your front and place a stopwatch on the floor in clear view. Bend the right leg into a 90-degree angle so the sole of the foot faces the ceiling. Rest on your forearms or lay your forehead on your palms. Raise the right thigh off the floor without lifting or tilting the hip. Turn on the stopwatch. Hold for as long as possible. Repeat on the left side.



STRETCHING THE GLUTES

The best way to stretch the glutes is the figure four stretch. This stretch can also be done standing and using the bike to balance, or sitting on a chair. Do the sitting version regularly at work, or on a bus or train to release tightness. Experiment with tilting the whole body to one side, then the other to work deeper into the glutes.

Version 1) Lie on your back with your legs bent and feet hip-distance apart. Lift the right foot off the floor, turn the knee out and lay the right ankle on the left thigh. Hold behind the right thigh and draw the legs towards the abdomen. Hold for 30-60 seconds. Repeat on the other side.

Version 2) To go deeper repeat as before but hold the front shin and draw the legs in. If the head lifts off the floor place a cushion or two underneath it. Hold for 30-60 seconds. Repeat on the other side.

Lexie Williamson is the author of *Yoga for Cyclists*.

Her style of yoga is called Vinyasa Flow. This is a dynamic form of yoga where movements are synchronised with breathing to stretch and strengthen the entire body.

4) THE CHAIR SQUAT

Stuck at a desk? Fire up the quads and glutes throughout the day with this squat technique. The one-legged version is more bike-specific but take care to check your form. Ensure the knees do not travel beyond the toes when lowering, look ahead and maintain a neutral spine.

1) Chair squat.
Stand in front of the chair, feet hip distance apart, toes pointing forwards. As you exhale, lower as if to sit down but hover above the chair. Inhale and return to standing. Ten reps, twice daily.

2) Single leg chair squat. Stand in front of the chair. Shift your weight onto the right foot. Bend the left leg behind you with the lower leg roughly parallel to the floor and the knees level. As you exhale lower towards the chair in a smooth, controlled movement. Inhale and return to standing. Five reps on each leg, twice daily.

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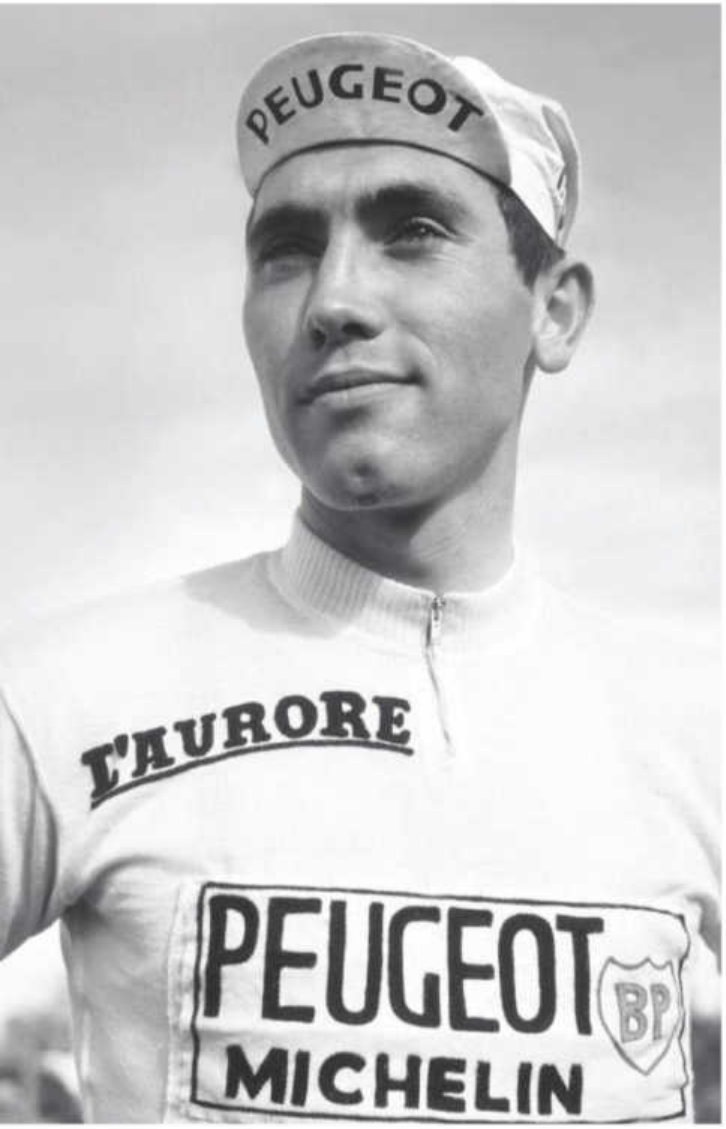

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5 MUST-AVOID WORKOUT MISTAKES

Everyone makes mistakes, and coaches tell us they're driven to distraction by seeing the same errors made again and again. These are five classic cock-ups to avoid at all costs

1 FOOD TIMING

When we eat is often determined by working hours and social norms rather than by hunger. If you are exercising a lot, then let your riding time dictate your meal times. This ensures you make the most of every opportunity to improve your recovery. If you've done a hard or a long ride, having a recovery drink afterwards is the simplest way of refuelling. Within the next 30-60 minutes after finishing your ride, sit down to a proper meal containing both carbohydrate to restock your muscle glycogen and protein to help support recovery. If you've had a really tough ride, or have trained late in the day, a recovery drink, glass of milk or bowl of low-sugar cereal before bed ensures there is protein available in your body for it to perform its overnight repair work.

Sit down to a proper meal within 30-60min after a long ride

Photo credit: Jessie Wild, Andy Jones

SOLUTION

Prepare your meals in advance of your ride so that they are ready to eat. Take recovery drinks or prepared meals to work in a lunchbox so you aren't starving after your ride and can eat at your desk if necessary. Eating as a family or with friends is an important part of being sociable, but aim to make your biggest meal the one eaten first after your ride — when your body needs the fuel. At other mealtimes, eat smaller portions, particularly if you are trying to lose weight.

2 STEADY RIDES

When someone says to you, "I'm going for a steady one tonight," what do you hear: a ride of consistent and even pace where the hills are ridden comfortably and the effort level maintained on the descents? Or do you hear, "You'll be fine, we'll be going slow."

Whichever you hear, you're probably wrong, as claiming a ride will be 'steady' is one of the biggest fibs riders tell each other. It is very rare for a 'steady' group ride to actually fit the standard definition of a steady training session. The average heart rate or power by the end of the ride may be in the right zone but probably doesn't tell the full story. Most 'steady' group rides quickly degenerate into a smash-fest, even though no one admits it; everyone joins in the collective delusion that it was steady — except the poor rider who made the mistake of riding at a genuinely steady pace and got dropped in the first five miles.

It's quite difficult to maintain a genuinely steady pace, as you feel like you are reining it in on the climbs and going flat-out on the descents.

SOLUTION

A genuinely steady ride is virtually impossible to achieve with other riders, one or other of you inevitably has to wait, so it is a good ride to do on your own. It's also a good test of pacing strategy and the mental skills needed to maintain focus.

You should be alone, rather than in a group, if you want to do a steady ride

Don't waste time on recovery rides if you only have limited time each week on the bike

3 DON'T TRY TO RECOVER LIKE A PROFESSIONAL

When it comes to training, we can learn a lot from pro riders. Yet recovery is different. You'll often hear pro riders refer to two- or three-hour rides as 'recovery'. For them, these long rides mean trundling along at a speed that barely registers as exercise and keeps their bodies ticking over. For most amateurs, though, a three-hour ride is a significantly large chunk of training time, and there is no point in wasting it on going slowly!

Similarly, we know pros spend a large amount of time relaxing. All their energy is reserved for training. Few of us have the free time to commit fully to training — nor the understanding partner who would let us get away with it!

SOLUTION

If you are riding for five to 10 hours a week, your approach to rest needs to be different to a pro (many of whom train for more than 30 hours per week). If, because of limited time, you ride only once every two to three days, you can scrap recovery rides altogether.

Other activities count as active recovery — including a fun pedal with the kids or some essential but boring household chores. These activities still involve movement, albeit without the intensity of training. Make your limited time on the bike really count. If you have done a really hard session, tough event or hard block of training, a very light 30-minute spin is enough to help stretch and relax you. There is no need for a three-hour recovery ride in an amateur's programme.

4 SOCIAL TRAINING

Riding with others is one of the most fun parts of cycling, and it can really develop your fitness. The problem for many committed club riders is that the social aspect becomes more important than the actual training; some turn up to every ride regardless of what they are trying to achieve. Smashing the Thursday night chaingang is a goal in itself, and for many people that is enough. However, if you have your heart set on doing well in an event or race, and this scheduling isn't producing the progress you want or expect, you might want to check your cycling social life.

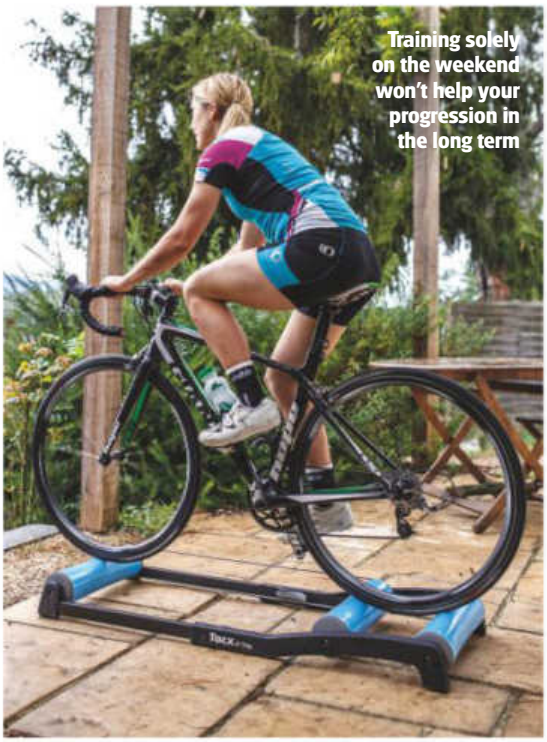
As with steady rides, outlined above, it is very difficult to train effectively with someone else, but you can make group rides work for everyone — given a little cooperation.

Don't let the social aspect of cycling stop you from getting good training in

SOLUTION

If you are motivated by riding with others, it is possible to tweak sessions so everyone gets a good workout — as long as it's agreed in advance. One way is to handicap the groups so that the slowest riders leave first and get caught by the fastest. Smaller groups of four working together means everyone gets a workout at their own pace, including the slower riders.

If doing intervals, set the slowest riders off first and let the fast riders catch them. Each interval stops when the front rider is caught.



Training solely on the weekend won't help your progression in the long term

5 WEEKEND WARRIOR

The term 'weekend warrior' describes a rider who trains or competes only at weekends, owing to time constraints. Smashing it up at the weekends and doing nothing in the week isn't a recipe for fitness or performance. Consistency is the bedrock of fitness improvement; a big ride at the weekend and then five days off won't produce the step up in fitness you are looking for.

After a week's complete inactivity, changes begin to occur in the body that result in fitness losses. For example, after three days, your blood volume can be reduced by five to 12 per cent. This means a decrease in the amount of blood your heart can pump — both in terms of amount of blood pumped per beat and total blood volume per minute.

The result is that your heart has to work slightly harder to maintain a given workload on the bike. There are some metabolic changes too. After six days, muscles begin to become less efficient at 'soaking up' glucose — the body's premium fuel for exercise — from the bloodstream. This means that during exercise you need to place more reliance on your (limited) muscle glycogen stores, and you also become less efficient at building up those glycogen stores after exercise.

SOLUTION

Leaving no more than two to three days between sessions will avoid fitness stagnation. We know that it is not always easy to cram in the sessions, but even just one midweek session will help maintain progress. Riding to work instead of commuting by car or public transport is an efficient way of getting time on your bike. Turbo-trainers or rollers are also your friends when it comes to making the most of even just a spare 30 minutes.

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CONQUER A LONG CLIMB

Climbing as fast as possible to the top of a big hill requires more than just grim determination: it takes skill and cunning

RESEARCH AND PLAN

Riding up a long climb can be as much a mental challenge as it is a physical one, and being prepared for it means being aware of what is to come. Despite the romance attached to heading out on the bike and simply seeing where the road takes you, knowing what is coming up and planning how to tackle it will get you the best results mentally and physically. Luckily there are numerous tools that help not only with planning your route but also with working out how best to ride it.

Nowadays, of course, it may seem like complete madness to go out on a ride without a GPS device that will upload your ride to Strava as soon as you finish. Before you even hit the road, using Strava's segment-explorer feature allows you to analyse particular sections of your route. You can go one step further and analyse the route via Google Street View — even pro riders use this in advance of a team route recon. This is a great tool for making a mental note of markers with which you can break up the climb into manageable segments.

By inspecting the climb online, you can picture yourself reaching the top. But don't neglect word of mouth; asking fellow cyclists about certain routes and climbs is another great way to gain advice.

PACE WITH PATIENCE

It is unusual for a ride to involve just one ascent from bottom to top; there will be supplementary challenges. Therefore, pacing yourself over the entire ride is crucial. You're unlikely to start out heading straight up the climb, so use the initial miles on the bike to warm up properly, spinning your legs and raising your heart rate.

The term 'pacing' should really be described as 'patience', as this is what you will need at the start of rides, when you are full of energy and want to shoot out of the gates strongly. However, your future self will thank you later on in the ride for reining in your emotions and starting off steady.

A cyclist's perception of how far they have climbed can be skewed by focusing too intensely on the summit; the here and now is more important. As well as bearing in mind the totality of the climb, attention should be focused on the immediate surroundings and the road ahead. Occasionally, when safe to do so, looking down at the road just ahead of the bike can trick the mind into making you feel as though you're riding on a flatter gradient. This way, you can ride strongly for the entirety of the ride.

FUEL OPTIMALLY

Of course, fuelling your body is vital to make sure you're able to maintain your optimal performance over the entire ride. This is no different when it comes to long climbs, where it is perhaps even more crucial. The added difficulty when the road heads skywards increases the need for energy.

However, fuelling isn't solely a case of loading up on energy gels or isotonic drinks at or before hitting the bottom of a climb. The recommended amount of carbohydrates a cyclist should consume per hour is 30-60g. This rate of intake may vary depending on the intensity of the ride, but do not consume more than the upper limit, as your body may not be able to absorb the large amounts of sugary gels. It is not just a case of pacing your effort but also pacing your consumption of energy foods. Taking on an energy gel and sipping your drink throughout your ride will be a lot more beneficial than gulping down your drink and gorging on bar after bar.

Staying hydrated is also crucial, using either isotonic, electrolyte drinks or just plain water. Becoming dehydrated can have a negative effect on performance if not taken care of, especially in hot weather. As with energy gels and bars, it is important to ensure that everything is taken in moderation, since over-hydrating can in extreme cases be dangerous.

LISTEN TO YOUR BODY

Cycling can sometimes be painful, especially if you are pushing your body to the limit. But there is a difference between trying hard and pushing so hard that you compromise your ability to recover. There is a time and place for competitiveness; pushing yourself as hard as you can to gain bragging rights over friends, club-mates and colleagues can sometimes be too tempting. Save that super-hard effort for when it really matters.

Remember, there is more to climbing than willpower. The engine is the most important thing of all, and that's you, your physical condition. Taking it easy on certain sections of the ride, and recovering properly post-ride, is critically important to realise your potential.

Provided you achieve the right work/recovery balance, then all the hard work will be worth it. You'll maximise your ability and, once you reach the top of a climb, you'll be able to look down with pride on where you have come from, geographically and in terms of your fitness progression. And you'll have earned the reward: the descent down the other side of the hill.

Photo: Daniel Gould

"IT CAN BE TEMPTING TO SHOOT OFF, BUT YOUR FUTURE SELF WILL THANK YOU FOR REINING IN YOUR EMOTIONS AND BEING PATIENT EARLY ON"

WINTER ISSUE

3 NEW TRAINING PLANS

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CONTACTS

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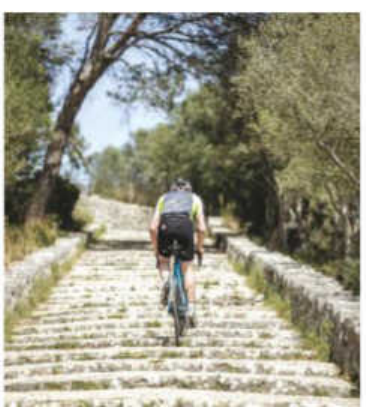

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HOW TO USE THESE TRAINING PLANS

Making the most of your time on the bike means finding the sweet spot between stimulating fitness adaptations and incurring fatigue, and there's no better way to calibrate your efforts than knowing what training zone to ride in... here's how to calculate yours

If you scan through any of the sessions in our three training plans you'll notice that the different parts of the ride are described using numbered training zones. Simply work at that level of effort for the time given.

How hard is 'Hard'?

If you're training entirely on feel, you can follow the basic effort and feeling descriptions below, but these are a bit vague, which is why we've linked them to a series of percentage zones based on either maximum heart rate or functional threshold. All you do is decide which approach works best for you, work out your zones and start training.

Working from feel

Columns two and three of the 'Training zones' table outline how each of our different training zones should feel and how much talking you'll be able to do at that intensity. Working from feel is a lot less precise than using heart rate or power, but it will work at a pinch.

Max heart rate zones

Heart rate is a measure of the strain your body is under and how hard it is working — the higher the heart rate, the greater the strain. If you have a heart-rate monitor, you can create a set of personal training zones based on your maximum heart rate (MHR).

You can use the following formulae to predict your MHR without so much as getting out of bed:

MEN: 214 – (0.8 x age)
WOMEN: 209 – (0.9 x age)

For a more exact number, perform the following simple (but not easy!) test:

- Ride Easy for 15-30 minutes, finishing up at the bottom of a long, steady hill.
- Ride up the hill for five minutes at a nice, Brisk pace, then coast back to the bottom.
- Climb the hill again. Start at the same Brisk pace, but this time increase your effort every 30 seconds. When you reach the point where you can push no harder, stand on the pedals and sprint until you simply have to stop.
- Coast back to the bottom and repeat step three again before riding home.

You'll probably hit your MHR somewhere towards the middle of the third ascent. (You will need a heart-rate monitor that records maximum heart rate to be able to perform this test properly).

Once you have established your MHR, simply use the percentage ranges in column four of the tables to set your own heart rate zones.

TRAINING ZONES

ZONE	EFFORT	YOU CAN...	% MHR	% FTP	% FTHR
1	Easy	Speak, sing and even dance!	65% or below	up to 55%	Up to 68%
2	Slow	Chat freely	around 70%	56-75%	69-83%
3a	Steady	Just about hold a conversation	around 75%	76-85%	84-90%
3b	Brisk	One sentence at a time, now!	around 80%	86-90%	91-94%
4	Threshold	Manage short sentences at best	around 85%	91-105%	95-105%
5	Hard	Only get out the odd word (you're breathing hard!)	around 90%	106-120%	106% or more
6	Very Hard	Grunt! Gasp! Pant!	N/A	121-150%	N/A

Functional threshold zones

Your functional threshold (FT) is the best average effort you can possibly manage in one hour of non-stop riding. Thankfully, it's not necessary to kill yourself in a 25-mile time trial to work out your FT. Instead, use the following test ride (devised by Hunter Allen of Training Peaks) to calculate a 'real-world' FT:

- Ride Easy for 20 minutes.
- Do 3 x 1min at a high cadence (120rpm) in a small gear with one minute Easy after each.
- Ride Easy for a further four minutes.
- Ride as hard as possible for a further five minutes.
- Ride Easy for 10 minutes.
- Ride as hard as you can for 20 minutes.

Aim to finish the 20 minutes having given absolutely everything you have. (You'll need to be able to record an average power or heart rate for the 20-minute all-out effort.) Once back home, work out the average power or HR for that final 20-minute effort, and multiply that number by 0.95. This will give you your FT, which you can then use to calculate your training zones, using the percentages in columns five and six, depending on whether your number is a heart rate or a power rating.

YOUR COACH

Oliver Roberts is a level two coach, specialising in cycling and triathlon, who works with PBscience.com. Over the past 10 years, he's created training programmes for the Race for Life 5K series, had three training manuals published and has coached athletes of all abilities, from novices to national champions, World Championship contenders and a National Ironman record holder.

Ride 100 miles in five hours

Riding over such a long distance will improve your endurance and give a solid measure of your fitness

When I first got involved in coaching, 15 years ago, the US cycling mags I was exposed to were awash with the idea of century rides. In many ways, the century was the forerunner of today's sportives. But to my mind the traditional 100-miler had one particular advantage: the distance was fixed, meaning that you had a much greater potential for measurable personal challenge from year to year and event to event. You didn't have to ride the same course again and again to get a sense of how your performances compared.

Outside of time trialling, there aren't many 100-mile events in the UK, but our most popular sportive is one: Ride London. Chasing a time over a distance that long requires a solid mix of endurance, fuel efficiency, pace control and fitness — all things that this plan attempts to offer.

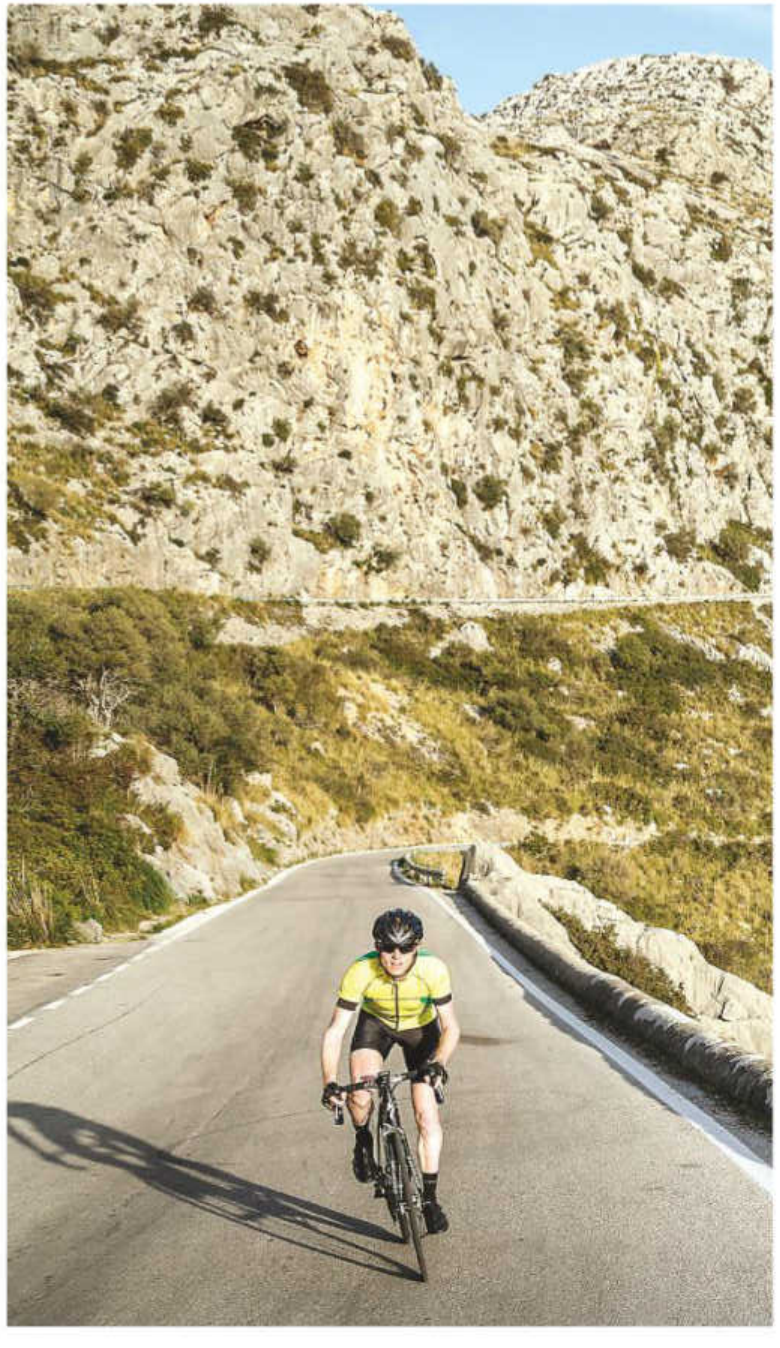
What's involved

Like the Faster plan that you'll find elsewhere in this issue, these 12 weeks mix rides that are primarily focused on fitness (long rides, sweet-spot efforts and Z4 climbing) with rides that are specifically tied to our performance goal (build rides, non-stop target pace rides and rides focused on maintaining an even effort over variable terrain). This is also a fairly high-volume plan, with two-hour rides in the week and a long ride of up to six hours.

The recovery weeks in weeks four, eight and 12 have been cut back particularly heavily in an attempt to prevent overreaching.

THIS IS THE PLAN FOR YOU IF...

- You're already capable of averaging 20mph over two hours
- You're keen to add an extra challenge to your sportive riding
- You're a triathlete planning to step up to long-distance or Ironman events
- You want to make the most of the autumn weather



KEY SESSIONS

Long rides

Probably the most important weekly ride, the long ride helps improve blood-flow in the working muscles, fuel efficiency and overall aerobic fitness. This particular version includes incremental blocks of sweet-spot, partly to give you a clear idea of your repeatable climbing pace, and partly to encourage you to keep your average pace up. Use a similar route each week to help you further refine your pace judgment and to encourage you to maintain an even effort from week to week.

Build rides

The build rides in this plan should provide all the benefits we'd expect: pace judgment and pain management, overall endurance, and fuel efficiency in the face of glycogen depletion — but with a twist because these rides ask you to maintain and build through certain average speeds, which should give you constant feedback about your progress.

Target pace rides

Here again, the physical benefits of what is essentially Z3 riding: improved power at lactate threshold, increased mitochondria in your working muscles and converting sprint muscle fibres to endurance fibres — anchoring them to your target pace. Don't try to hold a constant 20mph. You'll get much more value out of learning how best to modulate your effort in line with the changing terrain.

IN FOR THE LONG HAUL

WEEK	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
1 **YOUR WEEK'S TRAINING GOAL** To settle into the efforts and paces of the new plan	2hr: ride a flat route at 90-95rpm. Start with 30min Z2, then do 60min non-stop at 20mph and 80-85rpm. Finish the ride with a further 30min Z2	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain **TRY THIS** None of the rides in this plan is easy. Start every ride fuelled, and aim to consume 60g of carb per hour for the duration	REST DAY	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 45min Z2, then do 45min pushing up to Z4 on any rises, recovering to Z2 on the flats and downhills. Finish with 30min Z2 at 90rpm	REST DAY	4hr: ride on the border of Z2 and Z3a at 90-95rpm, except for 4 x 10min at Z3b and 85rpm spread out during the ride, ideally up some long climbs	2hr 5min: ride a flat, out-and-back route. Start with 1hr Z2, then turn and increase the effort so that you average 19mph for 30min, 20mph for 20min and 21mph for 10min. Finish with 5min easy spinning to cool down
2 **YOUR WEEK'S TRAINING GOAL** Ideally do Sunday's ride later in the day, a couple of hours after a meal	REST DAY	2hr: ride a flat route at 90-95rpm. Start with 30min Z2, then do 70min non-stop at 20mph and 80-85rpm. Finish the ride with a further 20min Z2	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 30min Z2, then do 60min pushing up to Z4 on any rises, recovering to Z2 on the flats and downhills. Finish with 30min Z2 at 90rpm	REST DAY	4hr 30min: ride on the border of Z2 and Z3a at 90-95rpm, apart from 4 x 10min at Z3b and 85rpm spread out during the ride, ideally up some long climbs	2hr 5min: ride a flat, out-and-back route. Start with 1hr Z2, then turn and increase the effort so that you average 19mph for 30min, 20mph for 20min and 21mph for 10min. Finish with 5min easy spinning to cool down
3 **YOUR WEEK'S TRAINING GOAL** To finish Block One's final full training week to plan	REST DAY	2hr: ride a flat route at 90-95rpm. Start with 20min Z2, then do 80min non-stop at 20mph and 80-85rpm. Finish the ride with a further 20min Z2	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain **TRY THIS** It's as important to maintain a solid Z2 on the flats and downhills, as it is to climb at Z4. Choose a route where you can actually put power out on the descents	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 30min Z2, then do 75min pushing up to Z4 on any rises, recovering to Z2 on the flats and downhills. Finish with 15min Z2 at 90rpm	REST DAY	5hr: ride on the border of Z2 and Z3a at 90-95rpm, except for 4 x 10min at Z3b and 85rpm spread out during the ride, ideally up some long climbs	2hr 5min: ride a flat, out-and-back route. Start with 1hr Z2, then turn and increase the effort so that you average 19mph for 30min, 20mph for 20min and 21mph for 10min. Finish with 5min easy spinning to cool down
4 **YOUR WEEK'S TRAINING GOAL** Top and tail Sunday's ride with 10min of easy spinning to warm up and cool down	REST DAY	2hr: ride a flat route at 90-95rpm. Start with 20min Z2, then do 60min non-stop at 20mph and 80-85rpm. Finish the ride with a further 20min Z2	Rest or 60min Z2 at 90-95rpm	90min: ride at Z2 and 90-95rpm, except for 4 x 5min Z4 at 90-95rpm with at least 5mins in between efforts	REST DAY	90min Very Very Easy, except for 3 x 2min Hard efforts spaced out so there's at least 5min recovery between efforts	60 miles, aiming to average 20mph

COUNTING THE MILES

WEEK	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
5 **YOUR WEEK'S TRAINING GOAL** To increase the workload per ride without easing back on the effort	REST DAY	2hr: ride a flat route at 90-95rpm. Start with 30min Z2, then do 60min non-stop at 20mph and 80-85rpm. Finish the ride with a further 30min Z2	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 30min Z2, then do 70min pushing up to Z4 on any rises, recovering to Z2 on the flats and downhills.	REST DAY **TRY THIS** These rides deserve a lot of respect. Start them fuelled. Eat half a bar an hour. Drink at least 500ml per hour. Have a protein recovery drink within 20min of finishing and get to bed early!	5hr: ride on the border of Z2 and Z3a at 90-95rpm, apart from 4 x 15min at Z3b and 85rpm spread out during the ride, ideally up some long climbs	2hr 5min: ride a flat, out-and-back route. Start with 1hr Z2, then turn and increase the effort so that you average 19mph for 25min, 20mph for 20min and 21mph for 15min. Finish with 5min easy spinning to cool down
6 **YOUR WEEK'S TRAINING GOAL** The most important thing about Wednesday's ride is not to push too hard	REST DAY	2hr: ride a flat route at 90-95rpm. Start with 30min Z2, then do 75min non-stop at 20mph and 80-85rpm. Finish the ride with a further 15min Z2	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 20min Z2, then do 80min pushing up to Z4 on any rises, recovering to Z2 on the flats and downhills. Finish with 20min Z2 at 90rpm	REST DAY	5hr 15min: ride on the border of Z2 and Z3a at 90-95rpm, except for 4 x 15min at Z3b and 85rpm spread out during the ride, ideally up some long climbs	2hr 5min: ride a flat, out-and-back route. Start with 1hr Z2, then turn and increase the effort so that you average 19mph for 25min, 20mph for 20min and 21mph for 15min. Finish with 5min easy spinning to cool down
7 **YOUR WEEK'S TRAINING GOAL** To maintain a Z4 effort on all of Thursday's climbs	REST DAY	2hr: ride a flat route at 90-95rpm. Start with 15min Z2, then do 90min non-stop at 20mph and 80-85rpm. Finish the ride with a further 15min Z2	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 15min Z2, then do 90min pushing up to Z4 on any rises, recovering to Z2 on the flats and downhills. Finish with 15min Z2 at 90rpm	REST DAY **TRY THIS** Try to arrange a route that gives you a headwind out and a tailwind home. It'll make the pacing far easier to handle	5hr 30min: ride on the border of Z2 and Z3a at 90-95rpm, apart from 4 x 15min at Z3b and 85rpm spread out during the ride, ideally up some long climbs	2hr 5min: ride a flat, out-and-back route. Start with 1hr Z2, then turn and increase the effort so that you average 19mph for 25min, 20mph for 20min and 21mph for 15min. Finish with 5min easy spinning to cool down
8 **YOUR WEEK'S TRAINING GOAL** Add some competition to Sunday's ride by entering a medium-length sportive	REST DAY	2hr: ride a flat route at 90-95rpm. Start with 20min Z2, then do 60min non-stop at 20mph and 80-85rpm. Finish the ride with a further 20min Z2	2hr: ride a flat route at 90-95rpm. Start with 20min Z2, then do 60min non-stop at 20mph and 80-85rpm. Finish the ride with a further 20min Z2	90min: ride at Z2 and 90-95rpm, except for 4 x 5min Z4 at 90-95rpm with at least 5mins in between efforts	REST DAY	90min Very Very Easy, except for 3 x 2min Hard efforts spaced out so there's at least 5min recovery between efforts	80 miles, aiming to average 20mph

THE END OF THE CENTURY

WEEK	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
9 **YOUR WEEK'S TRAINING GOAL** To focus particularly on the sessions including work at target pace	REST DAY	2hr: ride a flat route at 90-95rpm. Start with 20min Z2, then do 80min non-stop at 20mph and 80-85rpm. Finish the ride with a further 20min Z2	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 15min Z2, then do 90min pushing up to Z4 on any rises, recovering to Z2 on the flats and downhills. Finish with 15min Z2 at 90rpm	REST DAY **TRY THIS** You may find that introducing some caffeine gels in the final hours of this ride helps keep you on track — just make sure you have enough	5hr 30min: ride on the border of Z2 and Z3a at 90-95rpm, except for 4 x 20min at Z3b and 85rpm spread out during the ride, ideally up some long climbs	2hr 5min: ride a flat, out-and-back route. Start with 1hr Z2, then turn and increase the effort so that you average 19mph for 20min, 20mph for 20min and 21mph for 20min. Finish with 5min easy spinning to cool down
10 **YOUR WEEK'S TRAINING GOAL** Try to get some friends to join you for different parts of Saturday's ride	REST DAY	2hr: ride a flat route at 90-95rpm. Start with 15min Z2, then do 85min non-stop at 20mph and 80-85rpm. Finish the ride with a further 15min Z2	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 15min Z2, then do 90min pushing up to Z4 on any rises, recovering to Z2 on the flats and downhills. Finish with 15min Z2 at 90rpm	REST DAY	5hr 45min: ride on the border of Z2 and Z3a at 90-95rpm, apart from 4 x 20min at Z3b and 85rpm spread out during the ride, ideally up some long climbs	2hr 5min: ride a flat, out-and-back route. Start with 1hr Z2, then turn and increase the effort so that you average 19mph for 20min, 20mph for 20min and 21mph for 20min. Finish with 5min easy spinning to cool down
11 **YOUR WEEK'S TRAINING GOAL** Just make it through to the end of Saturday's session!	REST DAY	2hr: ride a flat route at 90-95rpm. Start with 10min Z2, then do 90min non-stop at 20mph and 80-85rpm. Finish the ride with a further 10min Z2	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 15min Z2, then do 90min pushing up to Z4 on any rises, recovering to Z2 on the flats and downhills. Finish with 15min Z2 at 90rpm	REST DAY **TRY THIS** Don't squander your extra rest day by filling it with chores. Sleep late, eat healthily and stay off your feet	5hr: ride on the border of Z2 and Z3a at 90-95rpm, apart from 4 x 20min at Z3b and 85rpm spread out during the ride, ideally up some long climbs	REST DAY
12 **YOUR WEEK'S TRAINING GOAL** Sunday try to draft without damaging your target speed and save energy	REST DAY	2hr: ride a flat route at 90-95rpm. Start with 30min Z2, then do 60min non-stop at 20mph and 80-85rpm. Finish the ride with a further 30min Z2	Rest or 60min Z2 at 90-95rpm	90min: ride at Z2 and 90-95rpm apart from 4 x 5min Z4 at 90-95rpm with at least 5mins in between efforts	REST DAY	90min Very Very Easy, apart from 3 x 2min Hard efforts spaced out so there's at least 5min recovery between efforts	100 miles, aiming to average 20mph

25 miles in under 60min

The sub-60min 25-mile time trial is one of cycling's most revered benchmarks. Here's how to smash it in 12 weeks

It's funny how things come back around. For many years, the gold standard racing effort in the UK was the 25-mile time trial. And the basic benchmark for competence in the event was 'breaking the hour'. Fast-forward to today, the 25 is still there as an event, ridden by skinsuit-clad, pointy-hatted devotees at weekly events across the UK. But that hour-long effort has now taken on extra significance, firstly in the 1990s with the rise of training with power and Dr Andrew Coggan's coining of the concept of functional threshold (FT) — the best effort you can hold over an hour of continuous riding — and even more in the past 12 months with the resetting and resurgence of the Hour record. So, how do you prepare to take that step up? This plan offers one approach.

What's involved

The three four-week blocks that follow aim to chart a path between the physical and practical demands of riding 25 miles in less than an hour. You'll find redline blocks designed to improve your ability to sustain efforts right up at your maximum lactate steady state/functional threshold, and efforts where the target is very definitely maintaining the average speeds necessary to ride at (or slightly faster than) 25mph. Even the test rides in weeks four and eight follow this approach — first checking your physiological capabilities with an FT Test and then checking your ability to average 25mph specifically. Regardless of which type of quality session you're looking at, however, you'll see that the workload progresses each week building your fitness and confidence towards an eventual target ride in week 12.

THIS IS THE PLAN FOR YOU IF...

- You're an aspiring time triallist
- You're an experienced rider looking for a change of focus after a summer of sportives
- You want to work on your ability to hold high speeds for longer periods
- You like to ride hard!

KEY SESSIONS

Target efforts

The sweet-spot and functional threshold efforts that you'd normally find in a time trial plan have been replaced with simple efforts that ask you to average 25mph. This should add a layer of pacing familiarity and confidence to the basic conditioning that you should get with efforts at this level.

Over-pace intervals

No route is likely to be entirely flat and windless. This means you will have to be able to cope with sustained efforts just above 25mph at times. Ideally, do these efforts on a flat route so that the effort required to hold speed is realistic.

Redline Fartlek

Probably the least pleasant interval sessions around, these work by alternating several Z4 efforts with similar length periods in Z3b but with no other recovery. To cope with this, your body quickly becomes much better at clearing blood lactate without a catastrophic drop in pace — all key to maintaining high efforts for extended periods.

Cadence blocks

The ability to produce power comfortably and consistently across a range of cadences is vital to riding fast. This is partly because it goes hand in hand with good pace control, and partly because extremes of cadence tend to result in improved mechanical efficiency, which in turn leads to higher speeds for a given effort.

LIFTING THE PACE

WEEK	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
1 **YOUR WEEK'S TRAINING GOAL** To find suitable routes for all your new rides	60min: start with 5min Z1, 5min Z2, 5min Z3a, 5min building to Z3b and 5min Z2. Then do 4 x 3min Very Hard with 3min Easy recoveries after each. Finish the ride with riding at the top of Z2 to make up an hour	REST DAY	70min: warm up with 15min Z2, then 5 x 1min at 120rpm with 1min Easy after each, then 5min building from Z3a to Z4, then 5min Z2. Now do 20min alternating 1min upper Z4 with 2min Z3b, all at 90-95rpm. Finish with 10min Z1-2 at 100rpm	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 5 x 5min at 80rpm spread out across the ride **TRY THIS** This ride requires a high degree of precision, and so it's always best to do it on the turbo-trainer	REST DAY	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 5 x 5min at 105rpm spread out across the ride	3hr: ride on the border of Z2 and Z3a at 90-95bpm, apart from 5 x 5min at 25mph and about 80rpm spread out across the ride
2 **YOUR WEEK'S TRAINING GOAL** Tuesday aim to push your HR to within five beats of your max by the end of each effort	REST DAY	60min: start with 5min Z1, 5min Z2, 5min Z3a, 5min building to Z3b and 5min Z2. Then do 5 x 3min Very Hard with 3min Easy recoveries after each. Finish the ride with riding at the top of Z2 to make up an hour	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 4 x 7min at 80rpm spread out across the ride	70min: warm up with 10min Z2, then 5 x 1min at 120rpm with 1min Easy after each, then 5min building from Z3a to Z4, then 5min Z2. Now do 25min alternating 2min upper Z4 with 3min Z3b, all at 90-95rpm. Finish with 10min Z1-2 at 100rpm	REST DAY	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 4 x 7min at 105rpm spread out across the ride	3hr: ride on the border of Z2 and Z3a at 90-95bpm, apart from 4 x 7min at 25mph and about 80rpm spread out across the ride
3 **YOUR WEEK'S TRAINING GOAL** To press on and complete the hard final week of Block One	REST DAY	60min: start with 5min Z1, 5min Z2, 5min Z3a, 5min building to Z3b and 5min Z2. Then do 6 x 3min Very Hard with 3min Easy recoveries after each. Finish the ride with riding at the top of Z2 to make up an hour	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 3 x 10min at 80rpm spread out across the ride	70min: warm up with 10min Z2, then 5 x 1min at 120rpm with 1min Easy after each, then 5min building from Z3a to Z4, then 5min Z2. Now do 30min alternating 3min upper Z4 with 4min Z3b, all at 90-95rpm. Finish with 5min Z1-2 at 100rpm	REST DAY	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 3 x 10min at 105rpm spread out across the ride **TRY THIS** The best place to do your 25mph block will be a quiet, traffic-light free loop that you can ride around anti-clockwise	3hr: ride on the border of Z2 and Z3a at 90-95bpm, apart from 3 x 10min at 25mph and about 80rpm spread out across the ride
4 **YOUR WEEK'S TRAINING GOAL** The purpose of Saturday's ride is to prime you for Sunday, not to tire you	REST DAY	90min: ride on the border of Z2 and Z3a, and at 90-95rpm, on a rolling route	Rest or 60min ride in Z2, but no other goals beyond that	90min: ride at Z2 and 90-95rpm apart from 4 x 5min Z4 at 90-95rpm with at least 5mins recovery in between efforts	REST DAY	90min: Very Very Easy, apart from 3 x 2min Hard efforts spaced out so there is at least 5min recovery between efforts	2hr ride including an FT Test

STRETCHING OUT THE MINUTES

WEEK	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
5 **YOUR WEEK'S TRAINING GOAL** A successful first attempt at your over-pace efforts	REST DAY	90min: start with 10min Z1, 10min Z2, 5min Z3a, 5min building to Z3b and 5min Z2. Then do 4 x 4min at 26mph with 4min Easy recoveries after each. Finish the ride with riding at the top of Z2	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 5 x 5min at 70rpm spread out across the ride	70min: warm up with 10min Z2, then 5 x 1min at 120rpm with 1min Easy after each, then 5min building from Z3a to Z4, then 5min Z2. Now do 30min alternating 1min upper Z4 with 1min Z3b, all at 90-95rpm. Finish with 5min Z1-2 at 100rpm	REST DAY	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 5 x 5min at 110rpm spread out across the ride	3hr: ride on the border of Z2 and Z3a at 90-95bpm, apart from 3 x 10min at 25mph and about 80rpm spread out across the ride
6 **YOUR WEEK'S TRAINING GOAL** Don't worry if your heart rate seems high for the speed, focus on staying smooth	REST DAY	90min: start with 10min Z1, 10min Z2, 5min Z3a, 5min building to Z3b and 5min Z2. Then do 4 x 5min at 26mph with 5min Easy recoveries after each. Finish the ride with riding at the top of Z2	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 4 x 7min at 70rpm spread out across the ride	70min: warm up with 10min Z2, then 5 x 1min at 120rpm with 1min Easy after each, then 5min building from Z3a to Z4, then 5min Z2. Now do 30min alternating 2min upper Z4 with 2min Z3b, all at 90-95rpm. Finish with 5min Z1-2 at 100rpm	REST DAY	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 4 x 7min at 110rpm spread out across the ride	3hr: ride on the border of Z2 and Z3a at 90-95bpm, apart from 3 x 15min at 25mph and about 80rpm spread out across the ride
7 **YOUR WEEK'S TRAINING GOAL** Plan your nutrition for the tough, sustained effort on Sunday	REST DAY	90min: start with 10min Z1, 10min Z2, 5min Z3a, 5min building to Z3b and 5min Z2. Then do 4 x 6min at 26mph with 5min Easy recoveries after each. Finish the ride with riding at the top of Z2	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 3 x 10min at 70rpm spread out across the ride	70min: warm up with 10min Z2, then 5 x 1min at 120rpm with 1min Easy after each, then 5min building from Z3a to Z4, then 5min Z2. Now do 30min alternating 3min upper Z4 with 3min Z3b, all at 90-95rpm. Finish with 5min Z1-2 at 100rpm	REST DAY	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 3 x 10min at 110rpm spread out across the ride	3hr: ride on the border of Z2 and Z3a at 90-95bpm, apart from 3 x 20min at 25mph and about 80rpm spread out across the ride
8 **YOUR WEEK'S TRAINING GOAL** If you're a time triallist, you may as well enter a 25-mile TT on Sunday	REST DAY	90min: ride on the border of Z2 and Z3a, and at 90-95rpm, on a rolling route	Rest or 60min ride in Z2, but no other goals beyond that	90min: ride at Z2 and 90-95rpm apart from 4 x 5min at 25mph with at least 5mins in between efforts	REST DAY	90min: Very Very Easy, apart from 3 x 2min Hard efforts spaced out so there's at least 5min recovery between efforts	2hr: start with 10min Z1, 10min Z2, 5min Z3a, 5min building to Z4, then 1min easy followed by 4min Z2. Next, do 5 x 15sec Very Hard with 45sec Very Easy after each, and then another 5min Z2. Now do 45min non-stop at 25mph before finishing the ride with easy spinning to cool down

TRY THIS Do these efforts on the flat, and ideally on the bike you'll be using for your eventual 25-mile effort

TRY THIS There's now a full hour at target pace in this ride, so start your ride fuelled, and aim to keep your blood sugar level by consuming 60g of carbs per hour ridden

WEEK	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
9 **YOUR WEEK'S TRAINING GOAL** To hit your pace targets on Tuesday and Sunday	REST DAY	90min: start with 10min Z1, 10min Z2, 5min Z3a, 5min building to Z3b and 5min Z2. Then do 3 x 7min at 26mph with 7min Easy recoveries after each. Finish the ride with riding at the top of Z2 **TRY THIS** It's likely that the best place to do your 7min efforts will be the loop you use for your Sunday blocks	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 5 x 5min at 65rpm spread out across the ride	70min: warm up with 10min Z2, then 5 x 1min at 120rpm with 1min Easy after each, then 5min building from Z3a to Z4, then 5min Z2. Now do 30min alternating 3min upper Z4 with 3min Z3b, all at 90-95rpm. Finish with 5min Z1-2 at 100rpm	REST DAY	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 5 x 5min at 115rpm spread out across the ride	3hr: ride on the border of Z2 and Z3a at 90-95bpm, apart from 3 x 20min at 25mph and about 80rpm spread out across the entire ride
10 **YOUR WEEK'S TRAINING GOAL** Stick to 60g of carb per hour and start eating 15min into the each ride	REST DAY	90min: start with 10min Z1, 10min Z2, 5min Z3a, 5min building to Z3b and 5min Z2. Then do 3 x 7min at 26mph with 5min Easy recoveries after each. Finish the ride with riding at the top of Z2	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 4 x 7min at 65rpm spread out across the ride	70min: warm up with 10min Z2, then 5 x 1min at 120rpm with 1min Easy after each, then 5min building from Z3a to Z4, then 5min Z2. Now do 33min alternating 3min upper Z4 with 3min Z3b, all at 90-95rpm. Finish with 5min Z1-2 at 100rpm	REST DAY	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 4 x 7min at 115rpm spread out across the ride	3hr: ride on the border of Z2 and Z3a at 90-95bpm, apart from 3 x 20min at 25mph and about 80rpm spread out across the last two hours of the ride
11 **YOUR WEEK'S TRAINING GOAL** Simply to power through your final hard week of training	REST DAY	90min: start with 10min Z1, 10min Z2, 5min Z3a, 5min building to Z3b and 5min Z2. Then do 3 x 7min at 26mph with 3min Easy recoveries after each. Finish the ride with riding at the top of Z2	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 3 x 10min at 65rpm spread out across the ride	70min: warm up with 10min Z2, then 5 x 1min at 120rpm with 1min Easy after each, then 5min building from Z3a to Z4, then 5min Z2. Now do 36min alternating 3min upper Z4 with 3min Z3b, all at 90-95rpm. Finish with 5min Z1-2 at 100rpm	REST DAY **TRY THIS** If you're really, really tired come Sunday, skip this ride completely and have an extra rest day instead	90min: ride on the border of Z2 and Z3a at 90-95rpm apart from 3 x 10min at 115rpm spread out across the ride	2hr: ride on the border of Z2 and Z3a at 90-95bpm, apart from 2 x 20min at 25mph and about 80rpm spread out across the last 90 minutes of the ride
12 **YOUR WEEK'S TRAINING GOAL** Don't overcook your efforts in Thursday's ride. Hold back and simply hit the target	REST DAY	90min: ride on the border of Z2 and Z3a, and at 90-95rpm, on a rolling route	Rest or 60min ride in Z2, but no other goals beyond that	90min: ride at Z2 and 90-95rpm apart from 4 x 5min at 25mph with at least 5mins in between efforts	REST DAY	90min: Very Very Easy, apart from 3 x 2min Hard efforts spaced out so there's at least 5min recovery between efforts	2hr: start with 10min Z1, 10min Z2, 5min Z3a, 5min building to Z4, then 1min easy followed by 4min Z2. Next, do 5 x 15sec Very Hard with 45sec Very Easy after each, and then another 5min Z2. Now do a whole hour non-stop at 25mph before finishing the ride with easy spinning to cool down

Ride your first long sportive

This is a plan focused on endurance for those targeting their first ever long-distance organised ride

One of the most difficult questions to answer as a coach is: "Can I really do this?" It's not so much that the answers aren't obvious (they are, and include, "Why don't you try, and find out?", "Might it be better to ask yourself if you *should* do it?" or "I can't predict the future, but based on what you've been doing…").

The real difficulty is that the question often betrays a nervousness and self-doubt that reassuring words alone cannot overcome. Sometimes, when someone is stepping up to a completely new challenge, or had a bad experience in their last attempt, you need to find a way to use their training to build confidence just as much as building fitness. That's what this plan is for.

What's involved?

This plan is about volume. It contains a lot of riding at steady, solid, even comfortably hard paces, but very little *really hard* effort. It's a plan that will make you tired more than it'll make you suffer. It uses a repeating weekly timetable of rides that very gradually increase in duration and intensity. At each step you should have built the confidence to move up to the next level.

Granted, many riders will be able to complete a long, challenging sportive (even up to the Marmotte) on less training than this plan contains. But they'd need to be very sure of their strengths and realistic about their pacing and nutrition in the event.

Get this work done, prioritise recovery, stay healthy and whole, and you'll roll up to the line as sure as you can be that you're prepared for the effort ahead.

THIS IS THE PLAN FOR YOU IF...

- You're a novice rider looking to step up to full-distance events
- You lack confidence in your ability to push harder in training
- You're looking for a straightforward general conditioning training plan

KEY SESSIONS

Sandwich rides

One way to 'trick' your body into adapting to the demands of long-distance riding is to train with reduced glycogen. Placing a block of Zone 3b work near the start of your ride shifts you to burning glycogen at a higher rate. You can then reduce your effort and ride in Zone 2 until the end, when you can increase the effort to Zone 3b again. Forcing your body to cope with the higher intensity when it's already depleted seems to trigger an increase in muscle mitochondria, which in turn increases aerobic fitness.

Progressive climbing

Repeated surges to sweet-spot and above during a ride seem to increase lactate threshold power and improve lactate clearance while still building underlying endurance and efficiency. Maintain a strong base effort of Zone 2 and you'll also find your pacing over rolling terrain and ability to recover while maintaining a solid effort improve.

Sweet-spot blocks

Perhaps the most time-effective way to improve your overall aerobic fitness is to work just below your functional threshold (FT) in Zone 3b, the intensity that you'll often hear called 'sweet-spot'. This intensity offers a balance of volume, lactate clearance, carb metabolism, cardiac output improvement without fatiguing your body to the detriment of other sessions.

PUSHING AND PULLING

WEEK	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
1 **YOUR WEEK'S TRAINING GOAL** To familiarise yourself with your three key training intensities	90min: ride on the border of Z2 and Z3a, except for 2 x 10min Z3b with 5-10min Z2 after each	REST DAY	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain	REST DAY	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 30min Z2, then do 60min pushing up into Z3b on any rises, recovering to Z2 on the flats and downhill. Finish with 30min Z2 at around 90rpm	REST DAY **TRY THIS** It's easiest to pace this ride with a power meter. If you don't have one, focus on keeping the flat and downhill effort a solid Z2	3hr: ride on the border of Z2 and Z3a at 90-95rpm, apart from 10min non-stop Z3b in the first half hour of the ride and another 10min non-stop Z3b in the final half hour
2 **YOUR WEEK'S TRAINING GOAL** Pick an anti-clockwise route for every week's Tuesday session	REST DAY	90min: ride on the border of Z2 and Z3a, except for 2 x 15min Z3b with 5-10min Z2 after each	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain	REST DAY	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 30min Z2, then do 75min pushing up into Z3b on any rises, recovering to Z2 on the flats and downhill. Finish with 15min Z2 at around 90rpm	REST DAY	3hr 30min: ride on the border of Z2 and Z3a at 90-95rpm, except for 10min non-stop Z3b in the first half hour of the ride and another 10min non-stop Z3b in the final half hour
3 **YOUR WEEK'S TRAINING GOAL** To maintain your effort levels despite fatigue	REST DAY	90min: ride on the border of Z2 and Z3a, except for 2 x 20min Z3b with 5-10min Z2 after each	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain	REST DAY	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 15min Z2, then do 90min pushing up into Z3b on any rises, recovering to Z2 on the flats and downhill. Finish with 15min Z2 at around 90rpm	REST DAY **TRY THIS** Focus on fuelling in your long rides. Drink every 10min, and eat half an energy bar every 30min	4hr: ride on the border of Z2 and Z3a at 90-95rpm, except for 10min non-stop Z3b in the first half hour of the ride and another 10min non-stop Z3b in the final half hour
4 **YOUR WEEK'S TRAINING GOAL** Tuesday jumps are not all-out sprints, but aim to stand up and push harder	REST DAY	90min: start with 30min Z2 at 90-95rpm, then do 30min Z3a at 70-80rpm with a 10sec Jump every 5min, then 30min Z2 at 90-95rpm	REST DAY	90min: ride on the border of Z2 and Z3a, except for 2 x 10min Z3b with 5-10min Z2 after each	REST DAY	90min: Very Very Easy, except for 3 x 2min Hard efforts spaced out so there's at least 5min recovery between efforts	A medium-length sportive — ideally a route with steady, gradual climbs rather than steep climbs. Ride Z2 on the flat, climb long climbs at Z3b and short climbs no harder than Z4

SETTLING IN SWEET-SPOT

WEEK	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
5 **YOUR WEEK'S TRAINING GOAL** To introduce harder efforts into Friday's ride	REST DAY	90min: ride on the border of Z2 and Z3a, except for 2 x 10min Z3b with 5-10min Z2 after each. Vary your cadence during each Z3b block, climbing any rises at 70rpm, spinning downhill at 90rpm, and rolling along the flat at 80rpm	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain **TRY THIS** If possible, keep your cadence on your computer throughout this session, and shift as often as necessary to stay on target. Stay away from steep hills, too	REST DAY	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 30min Z2, then do 60min pushing up to the border of Z3b and Z4 on any rises, recovering to Z2 on the flats and downhill. Finish with 30min Z2 at around 90rpm	REST DAY	4hr: ride on the border of Z2 and Z3a at 90-95rpm, apart from 15min non-stop Z3b in the first half hour of the ride and another 15min non-stop Z3b in the final half hour
6 **YOUR WEEK'S TRAINING GOAL** Go easy on the climbs and harder on the descents to keep output consistent	REST DAY	90min: ride on the border of Z2 and Z3a, except for 2 x 15min Z3b with 5-10min Z2 after each. Vary your cadence during each Z3b block, climbing any rises at 70rpm, spinning downhill at 90rpm, and rolling along the flat at 80rpm	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain	REST DAY	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 30min Z2, then do 75min pushing up to the border of Z3b and Z4 on any rises, recovering to Z2 on the flats and downhill. Finish with 15min Z2 at around 90rpm	REST DAY	4hr 30min: ride on the border of Z2 and Z3a at 90-95rpm, apart from 15min non-stop Z3b in the first half hour of the ride and another 15min non-stop Z3b in the final half hour
7 **YOUR WEEK'S TRAINING GOAL** To keep the pressure on throughout Sunday's ride	REST DAY	90min: ride on the border of Z2 and Z3a, apart from 2 x 20min Z3b with 5-10min Z2 after each. Vary your cadence during each Z3b block, climbing any rises at 70rpm, spinning downhill at 90rpm, and rolling along the flat at 80rpm	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain	REST DAY	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 15min Z2, then do 90min pushing up to the border of Z3b and Z4 on any rises, recovering to Z2 on the flats and downhill. Finish with 15min Z2 at around 90rpm	REST DAY **TRY THIS** Doing both blocks of Z3b in this ride on the same stretch of road should give you a bit of a 'carrot' to chase after when you're tired	5hr: ride on the border of Z2 and Z3a at 90-95rpm, apart from 15min non-stop Z3b in the first half hour of the ride and another 15min non-stop Z3b in the final half-hour
8 **YOUR WEEK'S TRAINING GOAL** Use other riders to your advantage in Sunday's ride, get in a group and draft	REST DAY	90min: start with 30min Z2 at 90-95rpm, then do 30min Z3a at 70-80rpm with a 10sec Jump every 5min, then 30min Z2 at 90-95rpm	REST DAY	90min: ride on the border of Z2 and Z3a, except for 2 x 10min Z3b with 5-10min Z2 after each	REST DAY	90min: Very Very Easy, except for 3 x 2min Hard efforts spaced out so there's at least 5min recovery between efforts	A medium-length sportive — ideally a route with rather more short steep climbs than in week four. Ride Z2 on the flat, climb long climbs at Z3b and short climbs no harder than Z4

FINDING YOUR THRESHOLD

WEEK	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
9 **YOUR WEEK'S TRAINING GOAL** Dig in for the final block of hard training	REST DAY	90min: ride on the border of Z2 and Z3a, except for 2 x 10min Z3b with 5-10min Z2 after each. Vary your cadence during each Z3b block, climbing any rises at 90rpm, driving down hill at 70rpm, and rolling along the flat at 80rpm	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain	REST DAY	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 30min Z2, then do 60min pushing up into Z4 on any rises, recovering to Z2 on the flats and downhill. Finish with 30min Z2 at around 90rpm	REST DAY	5hr: ride on the border of Z2 and Z3a at 90-95rpm, except for 20min non-stop Z3b in the first half hour of the ride and another 20min non-stop Z3b in the final half hour
10 **YOUR WEEK'S TRAINING GOAL** Practise your event protocol in one your long rides this block	REST DAY	90min: ride on the border of Z2 and Z3a, except for 2 x 15min Z3b with 5-10min Z2 after each. Vary your cadence during each Z3b block, climbing any rises at 90rpm, driving downhill at 70rpm, and rolling along the flat at 80rpm	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm. Keep your output consistent despite the terrain	REST DAY	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 30min Z2, then do 75min pushing up into Z4 on any rises, recovering to Z2 on the flats and downhill. Finish with 15min Z2 at around 90rpm	REST DAY	5hr 30min: ride on the border of Z2 and Z3a at 90-95rpm, except for 20min non-stop Z3b in the first half hour of the ride and another 20min non-stop Z3b in the final half-hour
11 **YOUR WEEK'S TRAINING GOAL** Complete a strong final pre-event long ride	REST DAY	90min: ride on the border of Z2 and Z3a, except for 2 x 20min Z3b with 5-10min Z2 after each. Vary your cadence during each Z3b block, climbing any rises at 90rpm, driving downhill at 70rpm, and rolling along the flat at 80rpm	90min: ride a rolling route on the border of Z2 and Z3a at 90-95rpm.Keep your output consistent despite the terrain	REST DAY	2hr: ride a rolling route on the border of Z2 and Z3a. Start with 15min Z2, then do 90min pushing up into Z4 on any rises, recovering to Z2 on the flats and downhill. Finish with 15min Z2 at around 90rpm	REST DAY	6hr: ride on the border of Z2 and Z3a at 90-95rpm, apart from 20min non-stop Z3b in the first half hour of the ride and another 20min non-stop Z3b in the final half hour
12 **YOUR WEEK'S TRAINING GOAL** Keep your rest days free from DIY, chores and rushing around. Relax!	REST DAY	REST DAY	90min: Very Very Easy, apart from 3 x 2min Hard efforts spaced out so there's at least 5min recovery between efforts	90min: ride on the border of Z2 and Z3a, except for 2 x 10min Z3b with 5-10min Z2 after each	REST DAY	90min: Very Very Easy, except for 3 x 2min Hard efforts spaced out so there's at least 5min recovery between efforts	Your target long sportive

TRY THIS Repeated Z4 efforts are tiring, so take care not to push too hard on the early climbs. Carry some extra fuel in case you need it towards the end

TRY THIS Make sure you have your bike serviced ahead of your event. The last thing you need is a mid-race mechanical

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From the makers of Cycling Weekly magazine, comes the Cycling Legends Series; showcasing the most accomplished riders and famous landmarks of the sport. The first two collector edition guides are dedicated to Eddy Merckx, three time Tour winner, and Mark Cavendish, the king of the sprints.

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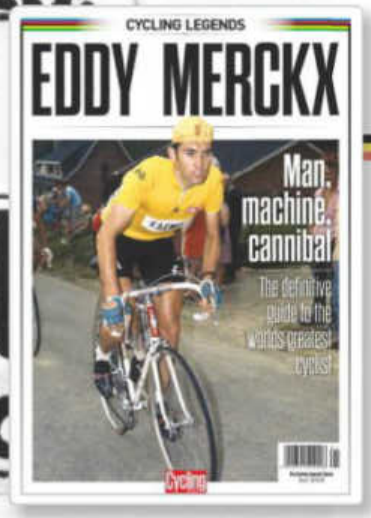

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